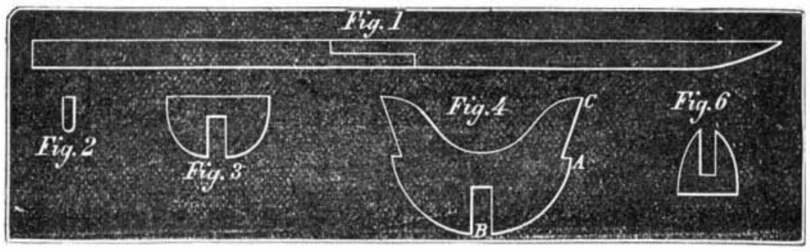
## Correspondence.

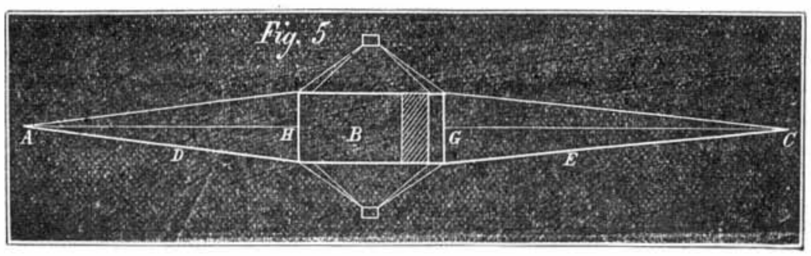
*The Editors are not responsible for the opinions expressed by their Correspondents.*

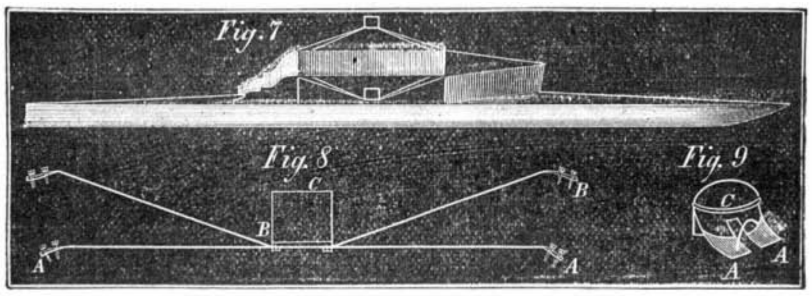
### Racing Boats.

Messrs. Editors:—To one who has never pulled an oar in a modern shell there is yet to be experienced a thrilling and exhilarating sport, never experienced when using heavy oars (weighing as much as three shell spoons); nor when the boat moves slow, preventing an energetic stroke, so characteristic of shell boats; nor when the position of the body, high above the water, places the oar at a bad angle with the water to get a fair pull.

To a great many young men, and lady readers, let me give a few words, and particularly to those living near a river or lake, or within a drive of one. When the writer first took up his residence on the banks of the Passaic, boating there was dormant. I had never been able to enjoy such opportunities for rowing before, and my enthusiasm was kindled by the reports of shell sports on the Hudson. I had the enthusiasm, but not the greenbacks to get the shells. To those who may have the same affliction, and also to those who may be afflicted with want of enthusiasm, but having means, it may be worth stating that it is possible for most ingenious persons to make their own shell boat, and to this end I offer my experience.




I procured two pieces of pine, ¾ inch thick, by 3 inches wide, which, when joined in the middle, made a keel just 30 feet in length, Fig. 1. This I set upon its edge, and rounded it on the bottom, Fig. 2, to fit the skin, or outside of the boat. From a piece of siding (or clap-board) I made the braces, Fig 3, of a width about 14 inches in the widest part, and tapering both ways, until no brace was required. Two braces were made different from those, of one inch thick, and of pine, see Fig. 4. The one nearest the bow, I placed 18 inches from the middle of the boat, the other about 30 inches. The depth of the boat and of these braces was about 5 inches, except that at the ends of the boat, when they can taper down to 3 inches. The two braces, Fig. 4, measuring from A to B, five inches; but from A up to C, 6 inches, or the width of a clap-board.

To make the skin of the boat I got a *basswood* plank (Spanish cedar was *the* wood, but economy was my aim). This plank was sawed and planed as thin as possible, like bandbox stuff. This I cut in lengths, so as to make the seams on the bottom. Break joints, from D to E, Fig. 5, two full lengths on both sides; then piece the ends. This stuff I soaked about an hour, before putting on. I used brass screws, and putting them in bent the stuff over the braces. In doing this, one should be sure that the keel rests on a good level bed, and is held by a piece, Fig. 6, nailed to the floor, or bed, the boat being upside down, and the keel fitting into this piece.

On the ends, over the basswood covering, fit a brass plate, to prevent breaking at the points. Cover the seams on the bottom of the boat, from "stem to stern" with a thin plate of brass (stencil plate stuff), using copper tacks to fasten it.

The boat is now complete except the top, the cock pit, seat, oar locks or outriggers, and spoons. On the top of the braces, all around the boat, fasten a thin strip, like a lath, and on braces, Fig. 4, let this strip fit into on the shoulder, A. Then put on like strips edgewise, from G to H, Fig. 5, to the ends of the boat, cover the whole of the top, with cloth (silicia, or or dress lining) tacking it to these strips. Cover the tack heads with a small bead. Now the boat is entirely closed in, except where the rower is to be seated. Let the seat be fastened to the keel.

The cock-pit is made by fitting the clapboards (or siding) around the braces, Fig. 4. At the end towards the bow fit two pieces to run out about two feet before meeting like a V, and at the stern let the pieces be formed in a graceful scroll. The irons, or outriggers, are 4 feet 6 inches apart, across the boat; and at their outsides, at bottom, about 14 inches from the water. The irons are made as shown in Fig. 8.

Another little attachment is a foot-board, the bottom of the boat being so thin that the feet must not rest on it. This is shown in Fig. 9. It is like a brace, to fit over the keel, with two pieces of sheet-iron (A A) for the heels to rest upon; C being a strap to pass over the instep, so that, in rowing, when the body goes back to get a full stroke, the feet help to bring into use nearly, if not quite, every muscle of the body. A pair of oars, or spoons, can be bought for about $9. Paint the boat a cedar color; top, a light drab. When you are ready to take a row, take off your watch, valuables, and other unnecessary weight, put on clothing that will not hurt by being wet, and seat yourself carefully; pull evenly, and this little craft, just as wide as your hips, and fifteen feet both sides of you, will fairly glide from under you. Do not look at the passing water at your elbow, but away back, and you will soon be able to row a mile, as I have done, in nine minutes.

Do not be afraid of getting wet when commencing, and you will probably not get a wetting. I have not tipped over yet, and if a person keeps cool, there is no liability to do so, for when the spoons are in your hands, you have complete control, and the tipping is of no consequence, unless you break something, then you are over as sure as a bird in the air with only one wing. I call my boat the *Home-made*, and it cost me, without the spoons, less than $20. N. F. P.

Paterson, N. J.

### Thunderbolts and Lightning Rods.

Messrs. Editors:—On Tuesday night, Aug. 9th, 1870, the weather being warm and sultry, with a display of silent lightning in the north, from early night up to the occurrence of a violent storm, described below, the barometer standing at 29·7°, thermometer at 85°, the air very humid, causing languor and depression of the nervous system, I determined to devote the night to the study and observation of the elements over head.

The humid air seemed to be conducting the surplus caloric of the earth, that it had imbibed through the feverishly heated day, up into the region of clouds, causing its fiery wings to flap as it labored up through the quasi-conducting medium.

At midnight the clouds began to thicken over head, and two thunder clouds, one from the N. W., and another from the S. W., were evidently forming a conjunction immediately over the city. There was very little wind below. The clouds were running low and had a peculiar dingy appearance, which in connection with the enervating sensation before mentioned, predisposed me to anticipate shocks of a coming earthquake. Soon, however, the heavens above developed a terrific display of electrical pyrotechnics. Flashing and crashing followed in quick succession. I was standing at the second-story window, and the heavens seemed literally on fire. The air was filled with ozone, perceptible to smell and taste. The trees and houses around were illuminated with a pale, lambent flame, and, suddenly, an explosion came that shook the earth. The windows of the house rattled, and things delicately poised toppled over. The pyrotechnic display for half an hour was grand beyond description. Several persons in the neighborhood screamed in terror as an explosion, within two hundred yards of us, took place. Of nineteen different persons that I conversed with that felt its effects, three aver that they were tumbled from their beds; several complained of being severely shocked; some of being benumbed; and most of being slightly shocked, some in the head, and some in the articulations of the joints.

About one o'clock the storm had passed so far to the east as only to be heard and seen in the distance. In the mean time the city had become aroused by the cry of fire, the ringing of church bells, and the rumbling and piping of steam fire engines. It was a night long to be remembered by the people of Lancaster; some asserting that they believed the Judgment day had surely come.

The following morning, in company with several gentlemen of our city, I made a tour of investigation in person, to see and learn how the question concerning thunderbolts and lightning-rods stood, for never before did this matter present itself so full and fair, and within my personal reach, for investigation. It summed up thus:

No. 1. Mrs. Kelly's house, corner of Orange and Shippen sts., standing on the highest ridge of the city, and provided with an iron lightning-rod, was struck on the rod, slightly bending and pressing the point. The large boards of the gable, running up within two feet of the rod, were set on fire and ignited the wooden structure of the roof between the slating without and the plastering within, permeating the whole surface of the roof and destroying it. The fire engines soon arrived and saved the main building, after flooding it it with water. The cellar wall of the building, corresponding to the line o the rod under ground, was shattered, and the mortar was driven out between the stones. The copper bell wire, running along the ceiling and middle of the cellar, was totally deflagrated, leaving a corresponding line of smoke in its train, up to the ceiling in the story above, and to the bell. The bell, and spiral spring fastening it to the wall, were intact, but the wall was perforated, and the plaster displaced, and, in the chamber over this, the washboard was punched away from the wall. The house contained a number of persons, but none were hurt, although near neighbors declare they were shocked and moved from their positions.

No. 2. Mr. Henry Doerr's house, in Water st., was struck. This was provided with a lightning-rod on its gable end, running up to, and some distance along the apex of the roof, jutting up two points six or seven feet in hight. The point nearest the gable end was slightly bent and fused, and the roof was fired at the edge where the rod turned over, and where it was insulated with glass. From this point the fiery bolt drove into and on the attic floor, igniting it and charring a surface the size of a hat crown, and a depth of a quarter inch. Mr. Doerr, smelling the ozone and fire, hurried up with several pails of water and put it out. This rod was a wire rope and set in glass insulators from end to end. Mr. McGinnes, the next door neighbor, who was, at the time, fixing his rain-water cask, had his hand singed and received a shock.

No. 3. The house of Mr. Thomas Silvius, situated on the lowest ground in the city, and on a little stream of water, close to the gas works, was struck, not on its highest point, nor on any point, but at the top of the valley formed by the cave of the main building and the top of the back building. The lightning tore up a few shingles, ran from thence down the valley of the conjoined roofs to the water trough, where it encountered a tin fender, placed there to keep the rain water from dashing over the trough, burned a hole an inch in diameter through it, passed thence along the trough to the pipe, and down the pipe, burning holes half an inch in diameter at each overlapping joint, splintering the edge of the rain cask, and exhausting its fury in the water. This house had no rod.

No. 4. The house of Dr. J. P. McCaskey, in Walnut, near Duke st., was struck on the kitchen chimney, the top bricks of which were knocked off, the fluid then passing down the the chimney and displacing a sheet of iron over the fireplace, and another portion taking the course of the stove-pipe, forcing open the stove doors, but doing no further damage. This house had no rod. Several houses within a hundred feet had rods, but were not affected.

No. 5. Mr. Eshback's house, at the North end of Duke st., was struck on the chimney, with no further damage than the displacement of a few bricks. This house had no rod.

No. 6. The Pennsylvania Central R. R. Co.'s telegraph office, in the depot, had its office-connecting wires burned out, and a chair standing near hurled across the floor.

In all this we have the evidence that buildings are struck indiscriminately, rod or no rod. The two buildings that had rods on them were the only ones that were fired, and it might be inferred that they received the heaviest bolts, but this is not the case. Nos. 4 and 5 were apparently slight. No. 3, that of Mr. Silvius, he describes as most terrific. Two of his daughters, having thrown their bed on the floor, and near the wall, were severely shocked, and the one nearest the wall for a while benumbed. Mr. Silvius was reclining, with his head on the window sill, under the water trough of the back building, and received a concussion on the top of his head that made him think for the moment he must die; and, to use his own words, "When I opened my eyes, the fire was raining down through the grape vines." This was an optical delusion. I experienced the same impression in the explosion that fired the Kelly house, being within two hundred yards of it. It is the vivid impression of the electric fire lingering on the retina of the eye.

Now comes up the query, why were the houses with rods on them fired, and those without not? If it were the reverse, the rods would be entitled to some credit; but, in this instance, they have acted the part of incendiaries. Like the needle in the celebrated Prussian and Chassepot guns, the rods conducted the electrical fulminate into the combustibles. And in my fifteen years' observation of them, they have distinguished themselves in that peculiar characteristic.

Lancaster, Pa. Jno. Wise.

### Cause of Thunder.

Messrs. Editors:—I recently saw an article in your paper entitled "Theory of Thunder." That is the decomposition of water by lightning, and the reunion of the gases, causing thunder. I am of the same opinion. In proof that it is so, I have often heard the sharp crack of the electric spark, immediately followed by the crashing roll of thunder, that is, when it strikes a rock or some blunt substance. The detonation of the spark is much louder than a rifle. Neither do I think that the crack of the electric spark is owing to the sudden collapsing of the air, but to the sudden expansion or contraction (as in the cracking of rocks, glass, and other brittle, partial non-conducting substances) or re-arrangement of the atoms of the bodies from which and to which it passes.

I have heard of cases of boilers being blown from their settings in a mysterious manner. I have known the gases generated from a smoldering fire in a blacksmiths' forge, when suddenly fanned so as to make a blaze, to explode, violently throwing the coal from the forge. By throwing a little water on the fire, and fanning gently and then strongly, so as to bring a blaze, I can almost always get an explosion.

Stoves, when filled too full, have been known to explode, tearing chimney and stoves to pieces. Why should not this be the cause of boilers being blown from their settings? The dripping of water from a leaky boiler causes the smoldering fire, from which carbureted hydrogen is distilled, which rises and mixes with unconsumed oxygen from the draft, forming a mixture which requires but the temperature of a blaze to explode.

Boston, Mass. Fletcher Symms.

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### Speed of Circular Saws and Saw Mills.

MESSRS. EDITORS:—Under the above heading, on page 51, current volume, appears an article from C. H. Crane, stating the amount of lumber cut with a circular saw 66 inches in diameter, running 800 revolutions per minute. As I am filing a circular saw in Messrs. Holt & Balcom's mill, in this city, I thought I would send you the amount of lumber cut in this mill the last week in July, sawing six days and six nights, the mill inside being in charge of Mr. Nicholas Emery.

I will give a short description of the mill, which has one stock gang, 26 saws, 24-in. stroke, one slabbing gang, sixteen saws, 28-in. stroke, one large circular saw, one splitting saw, one gang edger with four saws, and one single edger behind the circular. There are five boilers, 42 in. diameter, 22 ft. long, two 16-in. flues in each. Engine, 24-in. cylinder, 32-in. stroke, runs 70 revolutions per minute. All the saws are driven by friction pulleys, belts running from counter-shafts to saw arbors of edger saws, etc. Each gang has a driving pulley on main shaft of wood 10½ ft. diameter, 30 in. face, the driver pulleys on gang crank shafts are of iron 4 ft. diameter, and 30-in. face, making the gangs run over 180 revolutions per minute.

The circular has a driving pulley of wood 11 ft. in diameter, 30-in. face, and two counter shafts, one front and one back of main pulley, with an iron pulley on each, 4 ft. diameter, 30-in. face, making a double friction on a belt connecting the two counter-shafts. The large belt pulley on counter-shaft is 9 ft. diameter, and pulley on saw arbor, 30 in. diameter, which would make the saw run 693 revolutions per minute, has a 14-in. double belt.

The circular machine was built by Stearns, Clark & Co., at Erie, Pa. The saw arbor is 4 in. diameter, and saw collars 5 in. diameter. The saws are 60 in. diameter. No. 5 gage in center of saw, and No. 8 gage on rim, and made by the American Saw Co., Trenton, N. J., with Emerson's patent movable teeth.

The feed we carry with these saws is from 1 to 5½ in., according to the nature of the wood that it is cutting—our feed averages over 4½ inches to one turn of the saw. I have seen them cut 6 inches to one turn.

Each large saw has 32 teeth. There is an overhead saw, 34 in. diameter. They will cut 7 boards, 16 ft. long, per minute, or 6 boards 18 in. wide, or 4 boards, 24 inches wide, and 16 ft. long, per minute. I have seen them saw a log, making 20 cuts, 16 ft. long, and turn the log 4 times on the carriage in 3 minutes, all strips 1 in. thick and 6 in. wide. The logs that were sawed during the week were not picked logs, but taken out of the boom as they come, running from 12 in. to 40 in. diameter.

By the following table, which was taken from the tally-board for the week, will be seen the number of logs that was sawed on the gangs, and also those saw on circular, and the number of feet they measured:

| | No. of logs. | Gangs—day. | No. of logs. | Circular—day. | No. of logs. | Gangs—night. | No. of logs. | Circular—night. | Total No. feet. |
|---|---|---|---|---|---|---|---|---|---|
| Mon...... | 245 | 70,621 | 152 | 35,743 | 241 | 63,578 | 117 | 30,050 | 199,992 |
| Tues...... | 225 | 71,318 | 154 | 38,071 | 217 | 62,859 | 91 | 22,956 | 195,204 |
| Wed...... | 222 | 70,882 | 165 | 38,098 | 231 | 69,120 | 133 | 31,690 | 209,790 |
| Th...... | 244 | 80,213 | 157 | 37,070 | 237 | 75,323 | 141 | 32,599 | 225,205 |
| Frid...... | 256 | 80,371 | 162 | 40,146 | 237 | 73,335 | 139 | 32,837 | 226,689 |
| Sat...... | 257 | 81,321 | 141 | 40,800 | 261 | 77,999 | 113 | 30,128 | 230,248 |
| | | | | | | | | | 1,287,128 |

There were 4,538 logs cut; over three fourths being 16 ft., rest being 12 and 14 ft. long. Between 6,000 and 7,000 of 2 by 6 were saved on the circular, all the rest were what we call strips, 1 in. thick, and 6 in. wide. There were 150,000 laths cut in the same time with one bolting, and one lath saw only running in the day time.

The day hour commences at 6 A.M., and ends at 6 P.M., ½ hour for dinner leaves 11½ hours. Night tour from 6:30 P.M. to 5:30 A.M., ½ hour at midnight for supper, leaving 10½ hours. The circular lost 3¾ hours' time in all on Monday, Tuesday, and Thursday nights. Gangs lost about two hours' time.

I leave it for the readers of the SCIENTIFIC AMERICAN to say if this equals the sawing done by C. H. Crane.

We could cut 50,000 feet stuff the same dimensions as that which C. H. Crane sawed in the same time with this circular.

Oconto, Wis. LUKE BALCOM.

### Poison Oak.

MESSRS. EDITORS:—I notice in your issue of the 13th, an article from a writer in the *Entomologist*, who was suffering from the effects of a vine commonly known as poison ivy. The poison ivy of this country is entirely different in appearance from the poison oak common to the Pacific coast.

The poison oak grows there in the form of a small oak bush, often attaining a hight of four or five feet, and in some cases, has long, slender, vine-like branches. Its poison is much stronger than that of ivy, and will yield to no treatment that I am aware of but iodide of potassa. In the *very* worst cases of poison oak it gives immediate relief, as I have witnessed and experienced.

Any physician or druggist can put up a prescription in proper quantities.

Newark, N. J. ANSON SEARLS.

### Moon Fallacy.

MESSRS. EDITORS:—I have seen several articles in your paper in regard to cutting timber by "moon signs." More than forty years ago, I cut, for a number of years, at different times in the year, considerable second-growth white beech for plane stocks, which I think is the worst wood known to preserve sound (or keep from getting "dozy," as we used to call it). After trying many moony experiments, summer and winter, I came to this conclusion, that the true secret was to cut the timber when there was the least possible amount of sap in the body of the tree—say the coldest weather in the winter or the warmest in summer—June or February, when the sap is in the tops or in the roots of the tree. Every tree I cut after the sap began to start in the spring was sure to "doze," until June, when I found it safe to cut again.

G. W. HILDRETH.

Lockport, N. Y.

### To Prevent Cracking of Wagon Hubs in Seasoning.

MESSRS. EDITORS:—In answer to your correspondent E. H. H., of Md., who finds difficulty in the cracking of wagon hubs made from "black gum," I have to say that from satisfactory investigations made with the vapor of coal-tar wagon hubs and stock can be perfectly insured against cracking, shrinking, and swelling, in any climate.

The apparatus is very simple. Take a common "try pot," such as is used by whalers, or a farmer's large boiling kettle; fit to it a wooden cover, to fasten with small screw bolts or clamps to the rim to be vapor tight. A piece of one-inch gas pipe screwed into the cover serves to convey the vapor of the coal tar from this extemporized still to a large cask, which may be set upon one head, as a receptacle for the hubs. The still pipe is led to the bottom of the cask, which is then filled with hubs, and a cover fitted over all, to be vapor tight, with a small safety valve arrangement to regulate the pressure. The kettle is then filled with refuse matter from the gas works or crude coal tar, the cover secured, a fire lighted under the kettle, and shortly the hot lighter vapors penetrate the mass of hubs at a temperature of about 200° to 220° Fah. The hubs are effectually and gradually heated, so that all the watery particles are expelled from the wood in steam and replaced by the light vapors of the hydrocarbon oil. Subsequently the heavier oils are distilled over and fill the pores of the wood. The process is finished in about twelve hours, and you have a hub that will stand anywhere short of a fire. A few experiments will satisfy any one of the efficacy of this treatment. One of the products of this distillation is carbolic acid—the best known antiseptic—and the hubs will be found strongly impregnated with the peculiar smell of this well-known agent.

A large establishment would of course have a more perfect apparatus, but the above will serve to prove its value at small cost.

PACIFIC.

San Francisco, Cal.

### Seasoning Hubs.

MESSRS. EDITORS:—If E. H. H., of Md., will bore his hubs immediately after they are turned, and paint (as soon as possible after turning) the entire outside with any kind of paint which will effectually prevent the moisture escaping through the outside surface, then give them time to season, the moisture in the process of seasoning will escape through the aperture bored to receive the axle while the surface will be held intact. When well seasoned, mortice for the spokes and drive them in immediately; by doing so he will avoid the cracking of which he complains.

A. GREGG, M. D.

Indianapolis, Ind.

### Worms and Insects.

MESSRS. EDITORS:—I have been much pleased and instructed by the able articles appearing in your columns, on various characters of insect life, by Prof. Day, of Columbia College. Some of us, less learned in the homes and lives of the bugs and worms, would be glad to have him tell whence comes and whither goes the new and intensely disgusting worm which has, within a few years back, begun to attack the ailanthus trees. H. E. C.

Brooklyn, N. Y.

[These worms are those commonly called the ailanthus silk worm. They were, we believe, brought from France here by somebody as an experiment. Residents of Brooklyn no doubt wish the experiment had never been tried.—EDS.

[For the Scientific American.]

### THE TRUE THEORY OF FLYING.

The world seems to have concluded that the cycle of inventions is complete—that the telegraph has taken the last and topmost place; and that men must be satisfied with the great time and labor saved which they now possess.

But the Duke of Argyle, and a few other brave spirits, think differently, and are spending time and money in endeavoring to obtain for us the art of flying, which has so long bid defiance to human skill.

The writer has been deeply interested in the subject, and perhaps his conclusions may be of service to those who are experimenting upon the art. They are as follows:

1st. No successful flying machine can be constructed, which depends for its support in the air, upon the balloon principle—that is, which requires a bag full of gas for its flotation in the atmosphere. Because, the surface of resistance increases as rapidly as the propelling power is increased—greater weight of engine, etc., requiring greater size of balloon for its support in air. Because this plan has been tried both in New York and San Francisco without a shadow of success. Because it is in direct contravention of the method of nature. Every bird weighs so many pounds or ounces avoirdupois, and the heavier the bird, as a general rule, the more powerful and swift the flight.

2d. The future flying machine must be constructed upon some mechanical principles analogous to those which obtain in nature. Looking at these we find two prime requisites: 1st. A mechanical contrivance adapted to supporting and propelling the flying creature. 2d. A tremendous muscular power to call this machine into action. It would not be difficult to imitate the wings of a bird, with sufficient observance of the laws of mechanics to fulfill the conditions of ascent and propulsion, provided that we could get the power to drive our machine.

A system of properly-balanced and adjustable vanes, inclined on the principle of the propeller-screw will raise a flying vessel in air, and propel her in any direction. But the driving power must be enormous in proportion to the weight of machinery—just as the pectoral muscles of the bird are far more powerful than those of any non-flying animal; or, as far as I am informed, than any other muscles whatever, in proportion to their weight.

The whole question is then—What can we find analogous to the driving power of the wings of a bird? What power is there in nature which we can lay hold on and turn to our uses, which, nevertheless, needs no cumbersome boiler, no heavy fuel, and no complicated, and therefore weighty machinery—all and each of which are death to the flying machine theory.

Let us look at the known agents which we employ in propelling our machines.

There is steam. It requires no argument to show that its power is inadequate to carrying the necessary weight of machinery, etc., in air. Electricity is probably weaker than steam, under these conditions, in its present mode of use.

Either the power required must be concentrated before starting, and deposited in the machine in the shape of a compressed spring, or a cylinder full of condensed air, or we must get some new agent, as yet untried, which will give tremendous power without weight in as great proportion as in the known engine.

The compressed spring or condensed air plan may do for short flights. The writer however, has not much faith in either, and has not the present ability to test them by experiments.

But we have an agent sufficiently powerful and perhaps sufficiently governable, which will drive our flying machine for us with abundant force. Either gunpowder, dynamite, or the fulminates, have sufficient strength, with comparatively no weight. Witness the flight of a five-hundred pound shell for miles, at an elevation of thousands of feet, driven by a few pounds of powder! Consider the number of horse-powers involved in this exhibition of strength, and calculate the weight of the steam engine, its boilers, and fuel, which should accomplish such a result! There is no question about our having the power, but have we not too much? More than is controllable by human ingenuity?

The flying machine of the future does not need to draw upon these terrible forces to their full extent. Gunpowder and all explosives have limits to their power and are governed by laws, and can probably be used as propelling agents with a safety greater than that of the steam engine.

They are the only known agents which are, in their great power and small weight, analogous to the muscles of the bird.

How this power is to be applied and regulated could soon be ascertained by ingenious and educated engineers. Perhaps it would be well to have a cylinder in which successive explosions should preserve a constant and high pressure, which, by proper machinery, would drive the propelling fans.

Or, if a fulminate is obtainable which condenses to an insignificant amount of liquid immediately after explosion, a pair of iron hinges, as it were, which would expand and contract with great force by these successive explosions and condensations, might furnish the desired means of applying the power.

The rocket is a proof of the power of powder to carry vessels through the air. It is the rudest form of flying machine, and when the genius of man is fully directed to economizing and guiding the great power which is the cause of the rocket's flight, we will have a speedy, practical, and safe flying vehicle which will astonish the world by its simplicity and tardy discovery.

A few misconceptions on the subject may be spoken of. It is generally supposed that a flying machine must be a perilous means of travel. This is not so. If one were constructed on the principle spoken of in this paper, there would be no necessity of its travelling high in the air. A few feet above the ground would suffice, and many known appliances could be added, which would render a fall innocuous. The lower side could be arranged with powerful spiral springs, which would make a concussion harmless, or a system of parachutes could be devised by which passengers could descend to the ground with safety.

Arguing from the analogues of nature, as we find that the largest fish far exceed in size the largest bird, so science will find itself compelled by laws, at present unknown, to limit the size of flying machines to some such ratio with steamers, as obtains between bird and fish. If the largest bird is only one-tenth the length and general dimensions (not meaning bulk) of the largest fish, so, considering the largest steamers to be 500 feet in length, which they will probably not successfully exceed, we can expect flying machines, perhaps fifty feet in length. As the speed of the bird is swifter than that of the fish, so we can look for a greater speed in air, by the same rules, than in water. The flying machine in future will go to Europe in two days, and with greater safety and comfort than the present mode of transit.

They will be swifter, easy of construction, and will come into universal use, though they will be more expensive than other conveyances. Speed and concentrated fuel *mean* expense. As rapidly as the magnetic telegraph, when once invented, overspread the globe, so rapidly will every county and town adopt the new invention of the new future, the *hoplites* of traveling convenience. C.

HE who strikes out a new path in art, science, or literature, secures for himself persecution.

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