

error. With all deference to our intelligent mechanics, I believe this thing, simple as it is, is yet not generally understood.

A. B. L.

Stonington, Conn., July 21, 1861.

### THE RAM ARKANSAS.

The following is a private letter received at this office from an officer in the fleet at Vicksburg, dated "U. S. S. *Richmond* (just below Vicksburg), July 18, 1862 :—

I have written you, I believe, full details of our passing above the batteries at Vicksburg and our junction with Davis's fleet. On the morning of the 15th the combined fleets lay at anchor quietly, some five or six miles above the city, and very few of the vessels had steam up. All the lower fleet had let their fires go out and few of the others had steam enough to move instantly. A general feeling of security prevailed, as much as though we were in New York harbor. Yazoo river enters the Mississippi a few miles above where we lay—a narrow stream extending a long way up into the country—and it was supposed to be the retreat of most of the river steamers left in the rebels' hands after the capture of Memphis. An unfinished rebel gunboat and ram, called the *Arkansas*, was supposed to have been towed from Memphis up the river. A few weeks since a vessel or two of the Ellet ram fleet made a reconnoissance up this river; but on getting about forty miles up were stopped by a heavy raft of logs protected by batteries. Nothing more was done, not even to place guard boats at the river's mouth. The general impression was that the *Arkansas* was a myth, a failure, or that she drew too much water to get out of the river again at this season. About five days ago a couple of deserters reported that the raft across the Yazoo was removed and that the *Arkansas* was coming down soon. The powers that be did not seem at all alarmed, but on the morning of the 15th, just at daylight, the *Carondelet*, *Tyler* and a ram were sent up the Yazoo to reconnoiter, the rest of the fleet remaining as quiet as before.

The *Carondelet* is the one of Foote's iron-clads that ran by the batteries at Island No. 10. These boats, on account of gross miscalculation, are only partly iron plated, and heavy shot easily reach their steam drums, exposing the crews to a danger far worse than the missiles of the enemy. The *Tyler* is one of the wooden gunboats that did such good service at Pittsburg Landing. Ellet's rams, which first appeared at the engagement at Memphis, are simply fast river boats with their bows strengthened. Their only protection from shot are heavy timbers placed about the boilers and machinery.

Soon after the expedition left, on the morning of the 15th, rapid firing was heard, but little notice was taken of it. It was thought they were shelling the sharpshooters out of the woods. A few minutes before 7 A. M. our ram came down the river at full speed and spread the news that "the ram *Arkansas* was coming." All was bustle. Fires were lighted, and the thick smoke rolled of out the pipes of every boat in the fleet. But just a minute too late. The *Tyler* immediately appeared at full speed coming around the point fighting with her stern guns the ugly-looking *Arkansas* herself, which, without any hesitation, kept right down upon the whole fleet. First, it fired a broadside at the ram fleet, which lay furthest up the river; the advance gunboat, the *Wissahickon*, receiving two or three shots at about the same time. I thought the *Arkansas* would strike the next gunboat, the *Pinola*, with her iron prow, but she still kept on, evidently intending to ram this ship, the furthest in advance of the large ones. But she still kept on—now evidently bent merely on passing us. She had already received the compliments of the advance gunboats, and a shot from our rifle gun on the fore-castle, and as she passed the gunboat in advance of us, the men could be seen in her ports loading her guns. But when she passed this ship, and received of course our broadside, not a man dared come in sight, and we were consequently uninjured. She passed within less than a hundred yards of this ship, and I distinctly saw several of our 9-inch solid shot strike, two of which at least hit her just at the water line; yet she passed on apparently uninjured.

A short time before this, one of the most venturesome of our ram fleet slipped her anchor and bravely

stood out into the stream directly in the path of her iron antagonist. But it was only a sacrifice. A single shot fired at her passed through her boilers and disabled her, and, more sad to relate, we had reenacted under our very eyes the *Mound City* disaster—scalded men rushing out of the boat into the water. Just after passing this ship the *Arkansas* overtook our ram which she had disabled, drifting helplessly down the stream, and poured into her a full broadside. She soon passed the flag ship *Hartford*, the iron-clad flag-ship *Benton*, the *Essex*, and, in fact, all the other vessels in the squadron under a tremendous fire at close quarters and yet kept coolly on, turned the point and stopped under the batteries at Vicksburg. The *Benton* and another gunboat went down when they got up steam enough, and exchanged a few shots with the batteries at long range. The rebel, as he passed, fired at will from either of the four sides of his casemated chamber, and it seemed to be his principal aim to destroy our rams—his only objects of dread.

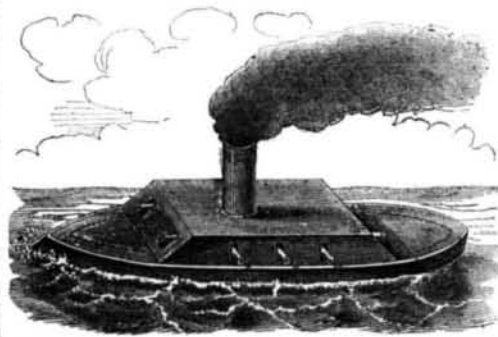
The feat took us completely by surprise, and was as daring as it was successful. It was more dangerous than the exploit of the *Merrimac*, and although perhaps the immediate loss to us in life and property was not quite as great in this case, the movement, in a military point of view, is a very disastrous one. The loss of life was greatest on the boats that were first attacked. The *Carondelet* was raked fore-and-aft with the rebel shots, and lost nine killed and a large number wounded. The *Tyler* fared still worse, as while she retired she made a stubborn resistance to her mailed antagonist.

To give you some idea of what a gauntlet the *Arkansas* ran, I will state that she was exposed to the fire of sixteen vessels, two of them, the *Hartford* and *Richmond*, heavy ships—the former having 20 nine-inch guns and 2 heavy rifles, and the latter 24 nine-inch guns and similar rifles; two sloops of war—the *Iroquois* and *Oneida*, and four gunboats belonging to the same squadron, beside Davis's fleet of five iron-clad boats, two gunboat rams captured at Memphis, and the wooden gunboat. If we had had steam up we could have rammed the thing, run her ashore or captured her in some way.

Soon after the ram passed all the vessels were ready for action! Just at dark that evening the whole fleet moved down and attacked the batteries, Farrigut's portion running by to its first position. The fire from the batteries was not as severe as when we went up. The attacking force was larger, which divided the fire more, and we came down of course much faster than we went up. Fortunately no one was injured on board this ship, though the others suffered as much as when we went up. The ram gunboat *Sumter* (captured at Memphis and belonging to Davis's squadron) accompanied us to practice on the *Arkansas* as we passed her, but the darkness and smoke prevented her being seen, as she lay close into the bluff under the batteries.

We are now anchored below the city in range of the lower batteries and anxiously awaiting further movements. The *Arkansas* is in plain view smoking and blowing off steam under the heaviest battery.

From what I can judge of the *Arkansas* from seeing



her pass so close to us, and from what I can learn from the pilots who saw her in Memphis before she was completed, I have made the inclosed rough sketch of her, and can describe her as follows:—

The *Arkansas* was built at Memphis, and after receiving a portion of her machinery and armor, was, some time before that place was captured, towed up the Yazoo river, where she was recently completed. She is about 175 feet long, 32 feet beam, and draws about 12 feet of water. Her hull, below water, is shaped much like that of a sea-going steamer; she is

propelled by two screws, one under each quarter. A single high-pressure engine is connected with each of the propellers. She has six of the ordinary 42-inch river boilers (which easily sustain a pressure of 180 lbs. to the square inch). Her boilers and machinery are entirely under water; she has but one smoke-pipe, a huge affair, passing up nearly in the middle of the vessel. The bow and stern are but little out of the water, and the former is built of solid timber for some distance aft. Amidships is a low casemated chamber with two portholes at each end and three on each side. Her armor consists chiefly of railroad iron backed by timber, like the *Merrimac*. She has no pilot house; her wheel is in the casemate chamber, which is furnished with a number of "peep holes" for the pilots. She carries ten guns, most of which are supposed to be thirty-twos, though we found when she passed us, that she had several very heavy rifled guns, and at least one 8-inch gun. Deserters who reached the flagship reported that the *Arkansas* lost five men, one of them her pilot, while passing the fleet, by shot which entered her ports. They say, too, that when we passed the city on the night of the 15th, an 11-inch shell (supposed to have been fired by the *Iroquois*) penetrated her casemate, and bursting on deck killed five men and wounded her commander. They also report the extravagant story that the *Star of the West*, now in Yazoo river, and the *Arkansas*, mean to run by the fleets in the river here and at New Orleans, then go to sea and put into Mobile. I verily hope they will try to do so. I fear the *Star of the West* will not get out of the Yazoo, much less run by the fleets with her two exposed beam engines. I hope, ere long, to see the flickering star of rebellion set in the West, never to rise again.

JULY 19, 1862.

Some officers, who have been taking a look at the ram, from the bushes on the point opposite, report that they can count eighteen places where shot have struck her, some of which are jagged holes through into the casemate chamber. It does not appear, however, that her machinery can be reached so as to disable her. The loss of a few men at her guns does not necessarily cripple her.

### Does the Mississippi Flow up Hill?

MESSENGERS. EDITORS :—At a late meeting of the Teachers' Association of the town of Johnstown, an opinion was delivered by one of the savans maintaining the affirmative of the above proposition, and embracing the following points :—

First, the terms up and down are used in relation to the distance of places from the center of the earth. Second, the earth being an oblate spheroid, any point north or south of the equator is nearer the center of the earth than any place on the equator. Third, the head of the Mississippi river (Lake Itasca) is situated some 2,000 miles north of its mouth. Therefore, as a conclusion deduced from the first two propositions, the river must in its course flow up hill, and that too a number of miles. The reason assigned for this apparent anomaly is the motion of the earth on its axis, and a consequent continual tendency of matter to flow from the poles to the equator.

On being asked why the course of the St. Lawrence is not similarly affected, the reply was, "Because the banks of that stream held the water in." Will the editor of the SCIENTIFIC AMERICAN please oblige the readers of his valuable paper in this locality by giving his opinion upon this subject? A. B.

[This is a mere dispute about the meaning of words. Up and down are not ordinarily used to express the distance of bodies from the center of the earth, but their relative distance above or below the level of the sea. The level of the sea is determined mainly by the balance between the centrifugal force resulting from the earth's rotation, and the power of the earth's gravitation. These two forces give the earth its form of an oblate spheroid, causing the surface at the equator to be 13 miles farther from the center than the surface at the poles. When water is raised above this surface the balance of the centrifugal force and gravity causes it to descend to the surface. Though the Mississippi at its mouth is some miles farther from the center of the earth than at its source, it does not flow up hill. Still, if any one chooses to say that it does, the assertion raises a question for lexicographers only; there is no difference of opinion in relation to the facts. EDS.]

### The Formation of the Whirlpool.

MESSRS. EDITORS:—Many of your readers have profited by numerous explanations called out by your publication of questions relating to mechanical subjects. I would like to read the various causes that would be assigned for the following well known mechanical experiment. Take a vessel of any size or form, as a common pail, attach a short piece of tube to the center of the bottom, fill the pail with water, and when it has become perfectly quiet, allow the water to discharge through the tube; soon the water in the pail will commence whirling above the tube, and air will be drawn downward through the water and tube, causing a sound as if drawn by considerable force. What causes the whirling of the water, and the passage of air downward through the water and tube? Will the water always whirl in the same direction in the vessel under like circumstances?

R. F. STEVENS.

New York City, August 12, 1862.

### Rotary Pumps—Fast and Loose Pulleys.

MESSRS. EDITORS:—There seems to be a general complaint that the various rotary fire engine pumps do not throw so solid a stream or do so good execution, under the same pressure, as the piston pumps. Is the objection well founded? What is the philosophy of the difference?

I find it a great advantage to turn the loose pulley somewhat less in diameter than the fast pulley, thus allowing the belt to contract while on the loose pulley and causing it to run tight on the fast pulley.

Ottawa, C. W., August 4, 1862.

[We were not aware that the rotary fire engine pumps were, as a rule, less effective than the reciprocating ones. If they are we can only account for it by supposing that it is because their packing does not work water-tight.—EDS.]

### On the Preservation of Meats.

The following interesting information is from *Cosmos*, by M. Martin De Lignac:—

"In the usual way of salting, the meat is placed first in salt, and afterward in pickle. The salt absorbs the liquids in proportion as they separate from the flesh, then the pickle penetrates by endosmose, and preserves them from any subsequent alteration by its antiseptic properties. But in this case the salt acts on the surface a long time before it penetrates to the center, whence results an excess of salt at the surface, whilst the center is not sufficiently salted, and still contains the principles of fermentation. To avoid this the habit is to cut up the meat; but this, while it increases the chances of its preservation, greatly alters its quality. In fact, the salt in contact with large surfaces, absorbs too largely the liquids contained in the flesh, and extracts from them the aroma and a portion of their nutritive juices. Pork, the tissue of which is dense and protected by fat, bears this preparation better than beef, the flesh of which, after long standing in the salt, presents only a fibrous tissue without flavor, and with but a low nutritive power.

It results from these facts:—First, that meat preserved by the usual process contains necessarily too much salt, and that its prolonged use is injurious to health; secondly, that it loses a part—sometimes a notable part—of its nutritive value.

The method of avoiding these inconveniences is to salt uniformly and not subdivide too far the meat, thus preserving its aroma and its juices. I think that I have found the solution of this problem, and the following are the means which I employ:—

If it is a ham which I wish to salt, I introduce, by means of a trocar, between the bone and the muscle at the small end, a sound which I attach to a stop cock, which communicates by a tube with a reservoir of water saturated with salt, to which are added various aromatics and condiments. The reservoir is from 25 to 35 feet high. When the stop cock is opened, the liquid by its pressure rapidly separates the muscle, and the two or three ounces of pickle which are necessary for the preparation of one pound of meat are easily lodged in the cellular tissue which surrounds the bone. Thence it forms a kind of reservoir; the liquid spreads, penetrating all the fibers by infiltration, distributing regularly and homogeneously the conservative agent, and producing its first effect upon the part most susceptible of alteration, that

which surrounds the bone. The hams thus prepared are put for some days in a pickle bath. The object of this bath is to prevent by its pressure the issue of the liquid injected, beside which it completes the preparation by saturating the surface. When they leave the bath the meat has lost nothing of the weight which it had at its entrance. I then expose them to a current of air at a moderate temperature. When by evaporation they have lost the infiltrated liquid and 5 per cent of their normal weight, I expose them to the action of smoke for a time which varies with their weight. This latter operation is not necessary for their preservation, but it gives them a taste which is generally sought for, and effects a reduction of weight. On leaving the smoke house they have lost from 12 to 15 per cent of their weight; before entering they had already lost about 5 per cent, so that their whole loss is from 18 to 20 per cent.

### JOHN SCOTT RUSSELL ON IRON-CLAD SHIPS.

At a meeting of the Royal Institution of Great Britain on the 16th of May, John Scott Russell delivered an address on "The Iron Walls of Old England," of which we find the following abstract in the *Mechanics' Magazine*.

#### IRON SHIPS IN GENERAL FAVOR.

It was not the first time the speaker had been allowed the honor of expounding such truths as had been the object of his special study, but he had never treated on one of so great national importance. He was somewhat rash, perhaps, in accepting from the managers the title of this address—rash because the subject was then in a state of transition. It was even worse now, for it had come to what geologists had called a "slip;" he might almost say he found himself at "fault." What he had to say now was as different as possible from what he should have said when he made the promise. Six or eight months ago he should have met here a formidable phalanx of adversaries—amongst them nearly all the naval officers—arrayed against him as the advocate of iron ships of war, and he should have had to argue every point as he proceeded. But unfortunately now we were all on one side; the pugilistic encounter which might then have entertained his audience could not come off. Twelve months ago he had written a pamphlet showing that the end of wooden men of war was at hand, and that it was a sin and a shame to send our sailors to sea in them; but the authorities of that day brought their guns to bear upon him and completely demolished him. Since then, however, he had got up again; and his heterodoxy had become orthodoxy, and he thought there would be no opponent of "iron walls" for the future.

#### RUSSELL'S OPINION OF AMERICANS.

About the beginning of the present year we were on the eve of war with a people who, whatever their faults, never hesitated to adopt for war the fittest weapons—who, long before rifles were introduced into our army, were celebrated for their use of them and for their manufacture—to whom we are indebted for the revolvers we found so useful in India, and which, whether they invented them or not, they brought to perfection. That people excelled also in ships; for while the English people, priding themselves on the beautiful "wave lines" on which their fast steamers were built, were slow to perceive the advantage of the same lines for their sailing ships; the Americans adopted them for their sailing vessels and came over and beat our fleetest yachts in our waters. It was the Americans, too, who first built ships of large size, and carried off our best freights in their large wave-line clippers. When going to war with such a powerful nation it became necessary to take stock of our fighting material. The Government did take stock of our fleet; and the extent of our navy, fit for a naval battle, at the beginning of the present year—as announced in a powerful leader in the *Times*—was one ship of the line. At the present moment we have two ships of the line fit for service, the *Warrior* and the *Black Prince*, and no more. This serious point is no longer a matter of speculation. It is now universally accepted as a fact—and accepted by us on a very small naval engagement in American waters, the contest of the *Merrimac* and *Monitor*—that an iron vessel of war is better than a wooden one; while the battle of the *Merrimac* with the *Congress* and *Cumberland* has settled

the point of dispute eight or nine months ago, viz., that a wooden vessel could not sustain the attack of a ship of war in iron armor. Sir John Hay, the chairman of the naval commission, is quoted in an excellent article in the *Quarterly Review*, as using this expression—"The man who goes into action in a wooden vessel is a fool, and the man who sends him there is a villain."

#### THE GREAT REVOLUTION OF SHELL GUNS.

Let us now inquire how this revolution has come about. How is it that our brave sailors ought no longer to face our enemies from behind our wooden walls? The revolution has been chiefly brought about by the introduction in artillery of horizontal shell firing. A certain General Paixhans, a Frenchman, contributed more than any one else to this result. He made cannon of eight or ten inches bore, by which explosive shells—which previously had been fired up in the air and had come down again upon their object—could then be fired straight at the mark, especially at a wooden ship, which was as good a target as an enemy could possibly desire. This horizontal firing was for a long while a favorite idea with artillerists; but they had very little opportunity of trying it in practical war. Sir Howard Douglas, speaking of its effects, says, "A shell exploding between decks acts in every direction; under the deck it would blow up all above it; on deck it would make a prodigious breach below it, at the same time that it would act laterally." The shell which accidentally exploded on board the *Medea*, on the lower deck, killed the bombardier and several of the crew, knocked down all the bulkheads, and threw the whole squadron into consternation; and the like effects was to be expected from an enemy's shell lodged before its explosion had taken place. The first experiment on a large scale in actual war was at the commencement of the Russian war. The Russian fleet, sneaking about the Black Sea, put into Sinope, and in a very short space of one morning sank and burnt the Turkish squadron. This battle was the entire effect of horizontal shell firing. The true nature of this horizontal fire has had another illustration.

#### WHY CRONSTADT WAS NOT TAKEN.

You were all astonished, and wanted to know why Sir Charles Napier did not take Cronstadt, and that our other fleet did not take Sebastopol. It was well known to professional men then why we did not, and there is now no reason why the secret should be kept. Our enemies know it, so why not our friends? Our sailors were not fools enough to stand to their guns in wooden ships exposed to horizontal shell firing. The speaker had read a letter from Lord Dundonald, one of the bravest sailors that ever trod the deck, written by him to Napier off Cronstadt, in which he expresses the greatest apprehension that Sir Charles would be goaded on to try the attack with what he called combustible ships. We tried Sebastopol—or rather we tried to "make believe." We drew up our fleet a great way off, and one or two brave sailors did go in closer. But the Russian gunners were trained to horizontal shell firing, and they soon found out it was best to be further off. The admiral was to be considered the wisest man on board the fleet, for he anchored his ship the farthest off. Those ships that ventured in were rendered by these shells incapable of continuing the action, and it is not now considered a disgrace to those sailors to say that after three shells had exploded in one ship it was not possible to find men "fools" enough to stand to the guns. Now, you know why we did not take Cronstadt; and why you did not know it sooner, was because the Government did not wish you should fail to believe in the wooden walls. At last, however, the *Monitor* and *Merrimac* have let out the secret, and I am here to tell you the whole truth. It need not be said that those shells at Sinope and Sebastopol were not the perfect weapons we have now—the Armstrong shells are much more precise, and will scatter greater destruction around them. How much more I may not tell.

#### PROTECTION AGAINST SHELL GUNS.

Attention has, therefore, since 1854 till now, been strongly directed to inventions for protecting ships from the effect of shells—and shot also, but chiefly shells. Men will stand against shot, but not against shells; they will run the risk of being hit, but will not face the certainty of being blown up. The inven-