levee, being careful to cover with earth to the point intended to grow. In a few months they will become as fixed as roots can make them. The white, or osier willow, should be used as it cannot be broken off by passing timber or by any other ordinary means. I have never seen the Mississippi, and know little of the manner of forming the levees, but I suppose them to be simply an embankment, parallel with the river. With this form in mind I will say that were the duty of preserving this embankment to devolve upon myself, I would insert three lines of willows—one on the water side at the base and sloping with the bank to a point near the top—another along the center of the top, and the other about half way down the embankment upon the land side, the last two to be inserted perpendicularly, to the depth of not less than three feet. In a few years these willows would send a net work of roots through every part of the embankment sufficient to resist the wear of any amount of water, and be far more durable than any piling of timber. While on this subject I will say a word in regard to the size of material to be used. The object desired is roots. Now these may as well be obtained from a twig the size of a rake handle, and even smaller, as from a stick of timber a foot in diameter. When once rooted they are safe, and sure to grow from five to fifteen feet in length the second year. They should be set in rows, say two feet apart in the row, and pretty soon the Mississippi will be hedged in with a living fence that may endure for centuries to come T. F. C. H.

Lawrence, Mass.

There can be no doubt of the strengthening influences of the willow when planted on the slopes of river embankments. Whether there may be peculiar influences in the Mississippi to neutralize this benefit we do not know. But the embankments built by Col. Colt at Hartford, Conn., by which he redeemed hundreds of acres from overflow and procured a site for his extensive works and for two villages, are protected by means of osiers thickly planted on both the land and river slopes. These send their roots for a number of feet into the bank and furnish a valuable crop of superior basket twigs, the manufacture of which into articles of use or ornament gives employment to several hundred hands.—Eds.

TECHNICAL WRITING IN THE DAILY PRESS.

It is quite safe to assert that there is but one thing that is likely to cause a writer to commit great errors in writing on a subject he does not understand, and that is, to be inspired by those who supply him with erroneous information either through ignorance or design, or both. The writers on the daily press are for the most part accomplished and scholarly men and treat scientific subjects with judgment when they take the trouble to read up; an important item which we are sorry to say, is but too frequently neglected.

The case in point is the report of the Special Correspondent of the N. Y. *Times* on the voyage of the French ironclad *Dunderberg* from New York to Cherbourg, and it is to be hoped that a few words spent in pointing out some of his errors may not be thrown away. Hence no apology is necessary for what follows.

The writer on the *Dunderberg* says "our ponderous engines (the largest that have ever been made in the United States) driving us through the water at a speed of 8½ knots,"—as there are no less than eight pairs of screw engines already built in this country, each larger than the *Dunderberg's*, the nonsense of this opinion is apparent. His directions for the treatment of a new engine are too unique to be omitted. "A new engine must be as carefully watched as a new babe .... each of its many members must gradually feel the strain. Here a little bracing is necessary, and there the tension (of the diaper pin?) must be relaxed. In this manner the various parts are at last brought into nice adjustment and perform their functions "harmoniously." The simplicity of that description is worthy of Homer or Walt Whitman!

In order to exhibit the tempestous (?) character of the voyage old Neptune is agitated, "thusly"—"In all my experience however I never knew anything to approach the *Dunderberg* in the quiet dignity of her behavior in a high sea." ... "It was not necessary at any time to put racks on the dining table, our crockery and glass ware keeping in position as securely as if we were on dry land."

The immense force of the huge waves is further shown as follows: "It was only when the sea was running high (?) that it washed over this low part of the vessel." This low part is the deck abaft the casemate and is but a little higher out of water than the monitors' decks; those who made the voyage in the *Miantonomah* will understand the hight of the sea necessary to wash over such a deck!

"I do not," he says," intend to convey the impression that the seas did not break over the main deck at all. On the contrary, they did *at times* curl over in considerable volume, making it necessary to batten down the hatches (over the officers' quarters) and vitiating to some extent the air in the wardroom below, but not to a degree that was *remarkably* uncomfortable." Query? How about ventilation, if they had encountered a gale when it would have been necessary to keep these hatches battened down? A little further on this marine observes: "Her superior ventilation," etc., "are all matters of record!" And, again, the weather was so fine that, as he justly remarks, "It was simply a prolonged excursion at sea, where no drawbacks to comfort existed except the single one—the absence of ladies."

Respecting models our marine architect thus discourses: "It cannot be long before the principles which have governed the construction of the *Dunderberg*, making her so easy and comfortable, are applied to ships generally. Such vessels, being relieved of the jacket of 1,000 tuns of iron, which encases the experimental ships, may indeed place sea sickness, and the minor discomforts at present inseparable from a voyage, in the catalogue of the things that are past." The readers of the Scientific American are, doubtless, aware that the cross sections of this vessel are almost precisely like those of a scow, the bottom being dead flat and the bilges nearly square—no curved futtocks are used, the side frames being joined to the floors like the gable of the ship-house in the navy-yard. A rudimentary acquaintance with the mechanics and hydro-dynamics of naval architecture is sufficient to point out to any one familiar with them that not only is such a construction about the worst possible for strength, but also for ease of motion in a sea-way. The latter for reasons which will be found demonstrated geometrically, practically, and mathematically, in any standard treatise on naval architecture. And if the object sought is to make such an immersed form positively unfit for ocean navigation, it can readily be attained by lowering the center of gravity of the ship; in the present case, this would be accomplished by "relieving" her, as this writer suggests, "of the jacket of 1,000 tuns of iron," which alone renders her motions tolerably easy; the log states the rolling was "deep and quick," but without "jerk,' Now, to produce as pretty a "jerk" as ever frightened the captain of an improperly stowed ship by seeing his masts cracking like whipstalks, it is only necessary to remove the armor. It would simply be another demonstration of the laws that must be regarded in relation to the form and disposition of weight necessary in order to have a vessel intended to navigate the ocean, properly balanced.

The injury to the national cause during the rebellion by the delay in the completion of "The Union-saving Ram," is thus alluded to by this naval critic:—

"Very few persons have forgotten the high hopes which were entertained during the dark days of 1863–4, when the rebels were receiving aid from England by way of Charleston and Wilmington, of the effective service which this mysterious engine of naval warfare was to render the cause of the Union, by the reduction of the forts which guarded the approaches to the harbors of the enemy. "Happily the war was ended before the formidable powers of the vessel could be tested." The idea of this "mysterious engine" reducing the forts in Charleston harbor and Fort Fisher, is decidedly rich under any circumstances, but it becomes richer still when it is borne in mind that her great draft of water (over twenty feet) would prevent her from approaching within anything like gunshot of the one, or within effective range of the other. The *New Ironsides*, with between fifteen and sixteen feet draft, had to be handled with the utmost skill to keep her from grounding while on service before Charleston. "While she was in progress of construction," so states this correspondent, "Mr. Webb was directed to enlarge the hull and engines to a size considerably larger than was at first proposed," and then, that his application to the Secretary of the Navy "for increased compensation was unsuccessful." Now this may be so, but it does not seem at all likely that the Government first ordered the vessel to be enlarged, and then refused payment for the additional cost, because it "would be compelled to modify the contracts between the Government and the builders of other iron-clads!"

Of course the question of armor and invulnerability receives more than a passing notice; the following extracts will suffice: "It is asserted in some quarters that the *Dunderberg's* good points are more than counterbalanced by the single fact that her armor is not as heavy as recent inventions in gunnery have proved that it ought to be to render her invulnerable. . . . I do not concede the justness or soundness of the objection." This refusal to "concede" to the "soundness of the objection" that projectiles from ordinary naval guns can riddle the armor of this vessel will no doubt cause those "foolish virgins" to pause and reflect, who put on iron to keep them out! But our vulnerable friend complicates his position by stating that "invulnerability is an excellent quality, and in a purely defensive warfare is doubtless the most valuable to possess. But in aggressive warfare there must be other qualities quite as essential." In other words, in "defensive warfare," as he terms it, the cuirass must be strong enough to keep out the enemy's missiles, but in "aggressive warfare" this is not important. No doubt a definition of these terms would be welcome to most of our readers, but what he really means it is impossible to say. In other words victory is important in one sort of warfare but not in the other! It is usually held that the duty of armor is to keep out shot and shells; if like the *Dunderberg's* as is admitted, it will do neither, what useful purpose does it fulfil as armor?

The "aggressive" qualities of the *Dunderberg* are thus set forth: "Speed and the ability to carry a heavy armament are as necessary as impervious armor," as she is utterly deficient in the latter, it is asserted that the former 'essentials obtain in the *Dunderberg* to a degree which is approached by no other iron-clad in existence. I say this in full knowledge that it cannot truthfully be contradicted."

This is what may be termed "doing the thing up Brown" As for speed, it is known that the *Dunderberg* is excelled by all the first-class iron-clads in either the French or English navies, and this opinion, founded originally on the result of the measured mile trial, receives a marked corroboration from the log of her Atlantic voyage. According to the log 82 tuns of coal per day were consumed, and the average speed was only 9 knots per hour; hence, as the consumption of coal increases as the cube of the speed, it will be seen that in order to maintain a speed of 13 knots, some 250 tuns per day must be used, and for a speed of 15 knots, no less than 378 tuns. Of course neither of these enormous amounts can be burned, and the wonderful speed claimed for this absurd shape is seen to be moonshine. This again suggests the subject of models, and a comparison will show that the orthodox forms were not designed by tyros or foolishly adhered to by the most successful constructors. The *Warrior* is a ship of about 3,000 tuns more displacement than the *Dunderberg*, and with a clean bottom can always be driven—as abundant trials prove—14½ knots in smooth water, and she is driven by a set of boilers of one third less area of grate and capacity than those of the *Dunderberg*. This shows how much easier the *Warrior*, with her regularly curved bottom, can be driven than the *Dunderberg* with her scow-formed bottom and straight sides.

The *Dunderberg's* machinery can doubtless develop as much power as that of the *Warrior*, and with the same economy of fuel. The *Dunderberg's* burning 82 tuns per day, or 7,649 pounds per hour, indicates some 2,200 horse-power, and as the speed increases as cube of power, it will be observed that to propel her during the voyage, 13 knots (according to the figures of the log), nearly 7,000 horse-power would be registered. The *Warrior*, deep loaded, runs 14½ knots with 5,500 horse-power.

Those interested in models will now have some idea of the power necessary to achieve high speed with the scow form, after making proper allowance for the conditions.

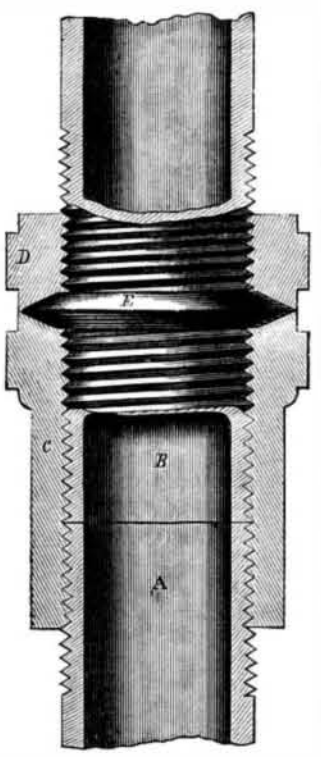
The following comparison it is not likely will be recognized by those who have had a look at the French ram: "The *Dunderberg* was floating like a swan, the outlines of the hull conforming more nearly to the shape of that bird than to any thing else." It is suggested that as she may be more formidable than she looks, a "singed cat" would be more appropriate as a comparison.

With regard to the ability of this vessel to carry a heavier armament than any iron-clad afloat, it is enough to say that there is not a large iron-clad in either the English or French navies but what can carry at least as heavy, and most of them a heavier, battery. The fact is that the gun deck of the *Dunderberg* is much too weak for the manipulation of twenty-tun ordnance. It is unnecessary to say that the same gun carriages on any other ship will work as well, and better with a deck of proper strength.

The following passages from hence to Europe made while the *Dunderberg* was at sea, will give to those familiar with North Atlantic navigation a pretty good idea of the character of the weather she was so fortunate as to enjoy. The *Scotia* left New York at noon, July 24th, arrived at Queenstown at noon, Aug. 2d. *City of Baltimore*, from New York to Liverpool, passage inside of ten days. *St. Laurent*, Brest July 20th, arrived at New York at noon, July 31st. *China*, Queenstown *via* Halifax, July 20th, arrived at Boston July 30th. ***

YOUNG'S PACKED PIPE JOINT.

The connection of metal pipes for steam, gas and water under pressure is always more or less difficult. It is seldom that the threads, either on the pipe or the couplings, fit so accurately as not to leak, and it is somewhat difficult to pack the parts so they shall be entirely tight under all circumstances. Of course, some method of packing these joints is desirable. One is shown in the engraving. A and B, represent two pieces of pipe joined together; C is the fitting or socket covering the joint between the pipes; D, is the lock nut, all shown in section. The approaching ends of the socket and nut are turned concave, and in the cavity thus formed, packing, designated by the letter, E, of some elastic substance or of soft metal, is introduced, and by the inclining sides of the cavity is forced firmly against the threads of the pipe and of the nuts. The result is a perfect joint, impervious to steam, gas, or water.



The patent is dated July 16, 1867, Wm. Young patentee, who may be addressed at Easton, Pa.

Grand Industrial Exhibition.

A workingman's fair on a large scale is to be held in this city next spring, the exhibitors being journeymen mechanics only. The projectors of this enterprise claim that hitherto all the industrial exhibitions held in this country have been under the control of parties having but little interest in the laboring classes, and as the products of labor exhibited by them were the property of capitalists, the honors and profits went to the credit of proprietors rather than the workmen. The fair next spring is to reverse this order of things, in the manner above mentioned. A circular has been issued to the journeymen mechanics of the United States inviting their co-operation in this movement.

Breech loading Arms.—The board appointed by this State for examining breech-loading fire arms, re assemble on September 17th. Patentees and exhibitors of guns of this class, desirous of presenting the merits of their respective weapons, will have an opportunity on that, or the four succeeding days, of testing their guns in accordance with the regulations adopted.

Steam Fire Engines.

Although hand engines for extinguishing fires are still largely employed in this country, the cities and large towns have very generally adopted the much more effective steamer, with its muscles of iron and steel, which never tire. Our engraving is a very accurate representation of a first class steamer on its way to a fire, and will give a correct idea of these powerful machines to our country and foreign readers, who may never have seen one. But the sheen and glow of the polished steel, iron, and brass, and the volumes of rolling smoke, the rapid rush of the horses, and the coolness and self possession of the men must be left mainly to the imagination. New York—the city proper, without reckoning the suburban cities and villages comprehended in the "Metropolitan Fire Department"—has no less than thirty-four steam fire engines. About one third are from the Amoskeag Manufacturing Company, Manchester N. H., the subject of our engraving being one of them. We append a description of "Metropolitan No. 1:"

The boiler of the steamer is 36 inches in diameter and 65 inches in length; it contains 313 copper tubes 24 inches long and one and a quarter inches in diameter. The boiler is of the best boiler plate cased in wood and covered with Russian iron, with brass bands, and with a brass dome and chimney casing.

There are two double-acting pumps lined with brass, four and a quarter inches in diameter, and 12-inch stroke, with rubber valves and brass valve seats.

The steam cylinders are eight inches in diameter and 12-inch stroke, working in the same piston rods with the pumps.

The engine is supplied with two lengths of best rubber suction hose, made upon copper rings four and a half inches in diameter inside. The suction pipe of the pumps is fitted on each side with a brass cup to close the openings if desired, and with a vacuum chamber made of burnished copper.

There are two discharge pipes for the leading hose, with a complete set of "nozzles" for change, from one and a half inches to seven eighths of an inch diameter.

THE METROPOLITAN STEAM FIRE ENGINE, NO. 1., EMPLOYED BY THE NEW YORK FIRE DEPARTMENT.

TRIAL OF ENGLISH AND AMERICAN BURGLAR-PROOF SAFES IN THE PARIS EXHIBITION--AN EXCITING SCENE.

Correspondence of Engineering.

PARIS, August 13, 1867.

The trial of the burglar-proof safes of Mr. Chatwood, of Bolton, and of Mr. S. F. Herring, of New York, or as our American friends like to call it, "the great contest of American *vs.* English safes," has commenced at last in the British testing-house at the International Exhibition. The terms and history of the challenge we have already published, but it may be as well to refer to them in a few words before proceeding to report upon the trial itself. Mr. Herring exhibited a safe upon which he posted a challenge offering to test it against any other safe in the Exhibition. Mr. Chatwood accepted this challenge, and an agreement was drawn up to that effect. Mr. Herring then declared that his safe was not really burglar-proof at all, but simply fireproof; but that there was a burglar-proof box inside the safe, which was the article meant, if not named in the challenge. The appearance of these after declarations created a somewhat unfavorable impression against the American safe-maker, if not against his safe, which occasionally manifested itself during the trial; but the jury certainly tried to do all in their power to maintain the balance as even as circumstances would allow. The jury was chosen by the two competitors; Mr. R. Mallet and Mr. R. F. Fairlie having been proposed by Mr. Chatwood, and and Mr. Holmes and Mr. Pickering representing Mr. Herring's interest. These four gentlemen had chosen M. Paul Douliot, engineer of the firm of Cail & Co., of Paris, as their fifth member, and as their president; and Mr. W. T. Hoyle, secretary of the Whitworth Company, acted as secretary to this jury. The jury met at 11 A. M. to-day, after the preliminary arrangements had been completed, then the sham burglars were introduced, three in number on either side. They were some of the best workmen that could be mustered in England, America, and Germany. Mr. Chatwood had brought one of his foremen and a workman from his shop; the third man, a foreman at Messrs. W. and J. Galloway and Sons, in Manchester, had volunteered his services on the day of the trial. Mr. Herring had sent expressly to America for a celebrated safe-breaker, who was assisted by a man described as particularly expert at picking locks; and the third also a volunteer, who was the foreman of an Austrian exhibitor of safes, who had a very intimate acquaintance with the construction of Chatwood's safes, having been in the Exhibition ever since its opening, and repeatedly examined Mr. Chatwood's drawings and details of construction, which are exhibited without reserve. These six men, combined in two respective groups, were an interesting match, although the unequal nature of their capabilities somewhat lessened the interest of the trial. Mr. Chatwood had in his favor the calm and business-like method of his foreman, and an extraordinary amount of skill on the part of Messrs. Galloway's man in the use of his hammer, which attracted the just admiration of every one present. On the other hand Mr. Herring's man showed much judgement and experience, assisted, as it was, by the correct knowledge of the Austrian foreman. The *personnel* having been mustered on both sides, the tools were brought forward. Mr. Chatwood's men had their tools packed in a neat small leather portmanteau. The contents were the well-known serrated wedges used by expert burglars, some levers screwed together in short lengths so as to pack up easily, a small hand hammer and a block-tin hammer which gives no ringing noise in striking. Against this the Americans brought in a sledge hammer, the exact weight of which has not yet been ascertained, but which may have been somewhere about 28 lbs. There were several levers and crowbars 5 or 6 feet long, and a complete drilling-frame large enough to enclose the entire safe, and to insert the ratchet brace for drilling. Last but not least, came some steel wedges of an enormous size. Call these burglars' implements! The jury immediatrly objected to the employment of this portable blacksmith's shop, and the sensible suggestion was made to allow equal weight, and a maximum size of implements only on each side. This, however, could not be adheared to, since the American tools were not prepared for such a condition, and all parties, anxious to see the trial through, agreed to allow the heavy American tools to be used, with the exception only of some of the very large wedges. The jury allowed the sledge hammer to the Americans, reserving to Mr. Chatwood the right to use a similar one if he thought necessary. This, although it changed the entire nature of the trial, was wise on the part of the jury, since it has been proved by the trial itself, that without sledge-hammers the trials would have lasted much longer than anybody would have cared to witness the operations, except perhaps Mr. Chatwood and Mr. Herring. The operations commenced at 2.45 P. M. There was a clear space all around each safe reserved for the workmen and the two sets were divided by a screen. In front of the latter, Mr. Walker, the well-known watchmaker of Cornhill and Regent street placed one of his beautiful chronometers for taking the time occupied by the different operations. A piece of wood sufficiently small to be enclosed in the little box inside Mr. Herring's safe, was put into this latter box, and a piece of similar size was put into Mr. Chatwood's safe; but Mr. Chatwood would not put his block into the small box inside his safe, as he declared that the contest was between the two safes, and not between a series of boxes hidden one within the other. Mr. Chatwood's workmen commenced by applying their small wedges to Mr. Herring's safe, while Mr. Herring's men tried their chance in drilling through the door in front of Chatwood's lock. The wedges did their work expeditiously, although the want of acquaintance with the details of Mr. Herring's construction caused some loss of time, the workmen attempting to drive in wedges at a place where the outer plate of the door overlaped the other part, and could have been removed by a cross-cutting chisel, so as to allow the immediate insertion of the wedge. In spite of this drawback, however, Mr. Herring's safe was completely thrown open in 29 minutes. The audience cheered, and Mr. Herring called out that this was only the fire-proof part of his safe, to which the English workmen replied by knocking out all the drawers and shelves of the safe and throwing them out on the floor. Meanwhile the workmen on the other side had erected their drilling frame, and worked the ratchet-brace, but without success. The drill touching the spiegeleisen which is behind the outer plate of Chatwood's safes, refused to cut, and the work had to be given up as impracticable. They also tried to pick the lock and to apply steel screws and punches to the door, but they made no progress in that direction, and had to give up all idea of forcing the door. As far as the trial had gone on with real burglars' tools, it had lasted till 3.45 P. M. After that the sledge-hammer came into request. Mr. Herring's men commenced the attack upon the dovetailing at the corners of Chatwood's safe by driving in chisels with the sledge. Mr. Chatwood then requested that his men should also be provided with a sledge-hammer for breaking the small box which contained the wood block, and this was at once agreed to by the jury. The hammer was brought in at 4 P. M., and then an amount of battering began at each of the two safes, which will be remembered for some time by every one present. The fragments of chisels and wedges were flying about the room, and the din was so terrific that crowds of spectators collected outside. "This is not burglar's work," somebody remarked; "the police would soon stop such a proceeding." But the police in the Exhibition had quite enough to do to keep off the people attracted by the noise, and, as usual, they were courteous enough to hear nothing. The work went on for about half an hour. The English workmen had the disadvantage of working upon a very small surface, as afforded by the door of the small box, enclosed as it was inside a large chest, which prevented a fair blow from being struck in any direction. Here the unusual skill of the striker proved of great value; his blows very rarely missed, although they were sometimes applied in the most trying positions. At Chatwood's safe the manual skill was less; but the men, knowing every joint and every pin, made steady progress, step by step, all parts being perfectly accessible for their operations. The attack was made upon the side of the safe next to the lock of the door; the dovetails were wedged open singly, and each of the connecting studs binding the outer plate to the inner structure was cut through by itself with large chisels. At 4.35 P. M. the outer plate of Chatwood's safe was removed entirely, and the spiegeleisen laid bare. In this form spiegeleisen, as is