## Correspondence.

### Bar Lead for Tempering.

*To the Editor of the Scientific American:*

I notice an article in a recent issue of your paper, on hardening steel by aid of zinc bath. I found a man recently, in the United States Mint here, who bored holes through the hardest steel and plate glass with drills. He told me that he drove the point of the drill, heated to cherry red, into a cold bar of lead, and the result was a much harder temper than the acid bath. S. P. DAVIS.

Carson, Nev., December 17, 1886.

### Cause of the Boiler Explosion.

*To the Editor of the Scientific American:*

In Mark Bacuitt's article in your issue of January 1, entitled "A Remarkable Boiler Explosion," it is stated "the only theory that Master Mechanic Ames can offer is that the cock in the tube connecting the steam gauge with the boiler was partially turned, shutting off half or two-thirds of the actual pressure." I do not see that diminishing the size of the connecting tube alters the pressure in the gauge. Does it? W. P. WOODWARD.

Howard, Pa., January 1, 1887.

### Camphor for Drilling Hard Steel.

*To the Editor of the Scientific American:*

Having occasion to drill through a very hard piece of steel, I tried a saturated solution of camphor (alcohol and gum camphor), and the result was marvelous, the drill apparently "biting" its way through the steel. Thinking your readers might be profited by a knowledge of this feature in drilling, I offer the same for trial, with the hope that those using it may be as well satisfied with the results as your subscriber has been. J. S. CHARLES, D.D.S.

Omaha, Neb., January, 1887.

### Gas for Ocean Steamers.

*To the Editor of the Scientific American:*

Attracted by an article in the SCIENTIFIC AMERICAN, of January, headed, "Gas for Ocean Steamers," and not taking much stock in the fruits of the imagination, the writer would submit the following in answer to the same; 3,800 tons of coal would occupy about 135,700 cubic feet. Now suppose that all this space were to be filled with gas at a pressure of 20 atmospheres (about 300 lb. per square inch), to how many tons of coal would it be equivalent? Allowing liberally for the use of the compressed gas in an engine (which the writer in question neglects) before it is used under the boilers as a fuel, it will be found to be equivalent to less than 200 tons of coal. That is, the gaseous fuel would occupy nineteen times as much space as the solid fuel. F. M. T.

### Gas for Ocean Steamers.

*To the Editor of the Scientific American:*

In Mr. Keller's letter on "Gas for Ocean Steamers," he proposes to store the compressed gas in tanks. A better plan to secure the coal space entire would be, I think, to store the gas in the water tight compartments common to all steamers of recent build. The gas could be conducted to the furnaces by a system of pipes tapping each compartment. The compressed gas would form a far greater resistance to the pounding of the sea, and would also prevent the compartments from filling with water in the event of an accident or collision at sea. The density of the gas would probably wholly, or at least partly, prevent rapid flooding of the compartments.

The greatest point of difficulty it seems would be the establishing of stations for filling the compartments previous to each trip. C. A. COOPER.

Washington, D. C., January, 1887.

### Propulsion of Vessels.

*To the Editor of the Scientific American:*

In your last two issues, I find a controversy about propelling ocean steamers by means of steam jets. It seems to me very strange that neither of these two gentlemen says anything about where to get the water from to generate the steam. On account of heavy incrustation of the salt water, the boilers would be injured, and I don't know whether they could purify enough water for all those boilers necessary to generate the steam. But as a source of safety, I think an auxiliary arrangement of a hydromotor would be very valuable. In case of breakage on the screw, shaft, or rudder, the hydromotor would be, it seems to me, just the thing. With sufficient capacity, the vessel could certainly make about 8 or 9 knots per hour, and this would be enough to bring her to some harbor in safety. Two-screw vessels, of which there is so much talk lately with ocean steamers, is nothing new. We have had them here on the lakes for nearly thirty years. Even if it would cost a little more to run two screws, I think they ought to be inaugurated on the ocean, for two are safer than one. We have here a small pleasure steamer, the Mascotte, with two screws, worked, of course, by two separate engines. She lost one of her wheels twice during the summer, but could run very well with one. With an ocean steamer, safety is the main thing, but it seems it is the last thing shipbuilders or companies think of. J. BENDER.

Toledo, O., January 1, 1887.

### Why the Tall Water Tower Fell.

*To the Editor of the Scientific American:*

Referring to your account of the rupture and fall of the 250 foot steel plate water tower at Sheepshead Bay in SCIENTIFIC AMERICAN, Dec. 25, 1886, page 405, I note that the contract called for "steel stamped 60,000 lb. tensile strength."

That the pipe was 16 ft. diameter for 70 ft.

That after the first 5 ft. the steel was ¾ in. plate.

I submit that from these data, the pipe being 250 ft. high, the rupture was demonstrably inevitable. Thus, the circumference inside is substantially 50 ft. = 600 in. The pressure per square inch on the ¾ in. steel—the pipe being full—would be substantially 113 lb.; 113 × 600 = 67,800 lb., the tensile lateral strain on any given vertical inch of the pipe, the pipe being made of ¾ in. plate. Add to this ⅓; $\frac{67,800}{3} = 22,600 + 67,800 =$ 90,400 lb. pressure. So that steel of 60,000 lb. strength lacked more than one-third of being strong enough to bear the strain. J. C. HODGES.

Morristown, Tenn., December 25, 1886.

### Why the Sheepshead Bay Water Tower Burst.

*To the Editor of the Scientific American:*

The figures given as to the height, diameter, and the thickness and tensile strength of the plates of the stand pipe of the Kings County Water Works, illustrated in the SCIENTIFIC AMERICAN of December 25, 1886, are suggestive, and tell a plain story as to the cause of the stand pipe's bursting. Steel is a very strong material, and a water tower made wholly of steel ought, perhaps, never to burst, but the strength even of steel has its limit. No one, it is clear, ought to expect steel to withstand a stress greater than its tensile strength. And yet that, as it seems, is precisely what was expected of the steel in this Sheepshead Bay tower.

Given a diameter of 16 feet, with the water standing at the height of 227 feet, the rupturing stress on the tower, at points 10, 20, and 30 feet above the base, was respectively, in round numbers, 56,400 pounds, 53,800 pounds, and 51,200 pounds, while the contracted strength of the steel at these points was only 45,000 pounds. At 40, 50, and 60 feet from the bottom, the stress was respectively 48,600 pounds, 46,000 pounds, and 43,400 pounds, against plates that were expected to stand only 37,500 pounds. Had the stand pipe been full, the stress would have been increased about 6,000 pounds.

In this estimate no consideration is taken of any lateral support to the plates. None appears except that offered by the base and the smaller pipe at the taper, and these are too remote to materially strengthen the middle 16 foot sections.

Evidently, the steel was better than Mr. Robinson contracted to furnish. With the extreme stress resulting from the great height and large diameter, plates much thicker and of greater tensile strength should have been required. But, in view of what was required, it is not surprising that this steel tower fell. The only wonder is that men of good mechanical sense and constructive ability should trust themselves anywhere near it when being filled. S. D. LOCKE.

### The Water Tower, Sheepshead Bay.

*To the Editor of the Scientific American:*

I have just finished reading the very interesting account, given in your issue of December 25 last, of the fall of a stand pipe, or water tower, at Sheepshead Bay. There have been several of these water towers destroyed during the last few years. There should be no difficulty in making these towers strong enough. The method of ascertaining the required strength should be the same as that used in steam boiler construction, and the margin of safety should be no less.

The tower at Sheepshead Bay had not sufficient margin of safety. The diameter was 16 ft., or 192 in.; the pressure 127 lb., which, multiplied by 192, gives 23,784 as the bursting strain. The material was ⅝ thick, which equals 1¼ for the two sides. The tensile strain of the material was 60,000 lb., which would resist 75,000; but as thick plates, even when riveted with three rows of rivets, cannot be depended upon for more than one-half of the original strength, the resisting strain is practically reduced to 37,500, which you will concede to be far from sufficient.

There are agencies which deteriorate and weaken these water towers that are quite as active and as unseen as the agencies which weaken and deteriorate steam boilers. With a view of directing your attention to the probable cause of the destruction of the tower at Sheepshead Bay, I will suppose the following:

The pumps, while filling the tower, also delivered the usual quantity into the general distribution; and in order to deliver 400,000 gallons in two hours, they will run to something over the usual speed. Now, suppose that for some reason the pumps were temporarily slowed down or stopped; the water to supply the general distribution would return from the tower, and would descend from the upper portion of the tower with a velocity of about one foot per second, which flow would be immediately stopped on again starting the pumps, thus subjecting the tower to a much greater pressure than that due to the height of the water.

These water towers, or stand pipes, as is well known to engineers, are of no use whatever except in connection with the Cornish engine. Therefore, if people will have them for landmarks or monuments, they should be closed at the top and used simply as air vessels.

The object for which the Egyptian Pyramids were erected may in time be discovered. But the object for which the stand pipe, or water tower, is erected in connection with the modern pump will forever remain a mystery. WM. GOLDING.

New Orleans, January 5, 1887.

### Taking Cold.

*To the Editor of the Scientific American:*

Reading, in a recent issue of your paper, an article of Dr. Brown-Sequard on "Taking Cold," it occurred to me that colds are peculiar to civilized life, and to our comfortable, warm rooms. I have had colds as frequently perhaps as any one, but during one period of my life I was entirely free from them, with one exception.

I served through the war in the Fifth Ohio Cavalry, beginning at Shiloh, and ending my service with the march to the sea. We were an active regiment, always at the front, and therefore always remarkably unencumbered with tents or comforts. We were exposed to all weathers and all seasons. Many a time we were rained on for a week or more. When the sun came out the next week or the week after, it dried us. Many a time, long after dark, after a march in rain and mud all day, we have been filed into miry woods, where we slept in the rain with the running water washing between us and our blankets. I have seen men wake in the morning with their hair frozen in the mud. But none of us caught cold. We swam the Tennessee River after midnight, when the mercury was at zero, and among floating ice, and came out with our clothes, to our armpits, frozen like sheet iron, and then marched till morning. In the cold winter of 1863–64, we were in the mountainous country of East Tennessee, where it is as cold as Ohio. We were there from November until March, without any tents or shelter of any kind, moving every day, and sleeping in a different place every night, with the temperature frequently below zero.

I have, with my comrades, ridden upon the skirmish line when I could not lift a cartridge out of my box, nor even pick up a carbine cap. I have been on night pickets, mounted, when the pickets had to be relieved every fifteen minutes, because if left longer the men could not load and fire. But we never caught the slightest cold, nor did I ever in times of cold and exposure to wet see a soldier with a cold. But I did catch one cold in the army, and I never had such a one before or since. It came from excessive comfort, or what seemed comfort to us. We were at Camp Davies, Miss., the southern outpost of the great fortress of Corinth. Having been there some months, we began to build neat log cabins, with openings for doors and windows—no glass or doors, of course.

One of our mess being a young bricklayer, we thought to surpass our neighbors in style and comfort, and we sent for brick, and he built us a large chimney and fireplace, and we built a good fire. That settled us. Four of us had to go to the hospital with tremendous colds on our chests and in our heads. We never had such heavy colds in our lives. This was about the middle of our three years of service, and before and after that I never saw an exposed soldier with a cold. (Of course a few days after our cabins were finished we got marching orders.) I believe all old soldiers will bear me out that in active campaigns, where there was great exposure to the weather, no one had a cold. And come to think of it, in my experiences in Colorado and Utah, in recent years, I never saw an Indian with a cold, though they stand more exposure than our cattle do. It is our hot rooms that give us our colds. If a person would camp out from fall till spring, exposed to the weather of a severe winter, he would never take either a cold, pleurisy, or pneumonia, and would be absolutely free from them. But when you are in Rome you must do as the Romans do, and take warm rooms and colds. ANDREW VAN BIBBER.

Cincinnati, O., Jan. 5, 1887.

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A PROPER, safe working load for wire ropes is as follows: One-half inch in diameter, 1,000 pounds; five-eighths rope, 1,500 pounds; three-fourths rope, 3,500 pounds; one inch rope, 6,000 pounds. This is for nineteen wires to the strand, hemp centers.