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JOURNAL
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ARTS AND MANUFACTURES, AND THE RECORDING OF
AMERICAN AND OTHER PATENTED INVENTIONS.

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Particulars of an Iron Steam Barge.

Hull built by Reaney, Neaffie & Co.; machinery by the same. Owners, Baltimore and Philadelphia Steamboat Company. Intended service, freighting between Baltimore and Philadelphia.

HULL.—

Length on deck,	148 feet.
Breadth of beam,	23 "
Depth of hold,	8 "
Contents of bunkers in tons of coal,	10
Masts, two, to be used as derricks for taking in cargo.	

ENGINES.—One.—Direct acting, inverted cylinder.

Diameter of cylinder,	28 inches.
Length of stroke,	26 "
Maximum pressure of steam in pounds per sq. in.,	80
Cut-off from commencement of stroke,	13
Weight of engines in pounds, estimated,	29,000

BOILERS.—One.—Flue and return flue.

Length of boiler,	20 feet 6 inches.
Breadth "	6 " 6 "
Height " exclusive of steam drum,	7 " 9 "
Cubic feet of steam drum,	225
Weight of boilers in lbs., with water, estimated,	32,000
Number of furnaces,	2
Breadth of furnaces,	3 "
Length of grate bars,	5 " 6 "
Heating surface,	700 square feet.
Consumption of coal per hour, estimated,	336 lbs.

PROPELLERS.—

Diameter,	8 feet 1 inch.
Length of blades,	2 " 8 "
Depth "	15 "
Number "	4
Average revolutions per minute, estimated,	75

Remarks.—Frames, $\frac{3}{4} \times 3\frac{1}{2}$ inches, and 15 and 18 inches apart; 7 strakes of plates from keel to gunwale; thickness of plates $\frac{3}{8}$ and $\frac{1}{4}$.

W. J.

For the Journal of the Franklin Institute.

Steamboat Explosions.

Whenever we have an account of a boiler explosion, we hear the cry for a week or so for new laws, and more stringent provisions, careful inspection, &c., &c., and the General, State, and Municipal Governments are in turn solicited for their interference, and abused for their negligence, until the epidemic excitement has run its course in a few days, and all the clamor subsides, to be re-awakened by a new catastrophe. How far we want new laws, or how far the present regulations are available, may, we think, be gathered by glancing at the result of the examination of an engineer of a Mississippi boat which exploded, killing, in the opinion of the captain, from eighteen to twenty persons.

The character of the explosion may be collected from the subjoined testimony of the Captain, and the Government Inspector :

“September, 1854.

“EDMUND F. DIX, sworn on the part and behalf of the United States, says: That he was Captain or Master of the steamer *Timour*, No. 2, on the 26th day of August, 1854, and at the time of the explosion of the boilers of said steamer, about three miles below Jefferson City, on the Missouri river. The explosion took place between 10 and 11 o'clock, A. M., of the said day; after I had landed the boat, I walked down to the boiler deck; I had been there probably half a minute when the boilers exploded; the next place I found myself was on the fore-castle; all three of the boilers exploded, and the decks were broken down; I heard one tremendous crash at the time of the explosion, and that was all that I recollect of hearing; everything that I saw about the boat afterward, seemed to be dry, and the persons injured seemed to be burnt rather than scalded; I had not noticed anything unusual in the condition of the steam on the boat; there had been no extra exertions to increase the steam, previous to the explosion, to my knowledge; from the time of the landing of the boat up to the explosion, it could not have been more than three minutes; my opinion is, that there were from eighteen to twenty persons killed by the explosion; I noticed a piece of the boiler on the side of the hill, one hundred and fifty or two hundred yards from where the boat was lying; I have been steamboating for fifteen years; from my experience and observation, such as it is, I have formed the opinion that the explosion was caused by want of water in the boilers.

“*Cross-Examined* by Captain Hudson.—There was no unusual head of steam at or up to the time of the explosion; the boilers of the *Timour* had been in use about three years; all of the boilers were at one time so much burnt that one sheet had to be taken out of each of them, and new sheets put in; this burning was caused by there being very little water in the boilers; at another time, one of the boilers was heated in the same way, so that the sheet had to be taken out; one of the boilers might be so burned without affecting the others; Mr. M'Cord and Mr. Scott, the persons who are now under examination here, were the two engineers on the boat at the time of the explosion; Mr. M'Cord had the reputation of being a careful man; I did not know Mr. Scott until he came on the boat as second engineer.

“Being *re-examined*, says: That the boilers were inspected once by the Government Inspectors since the last burning above spoken of took place, and at the time of repairing the said burns, all the injured portions were removed.

“ (Signed,)

Capt. E. F. Dix.”

“DAVIS EMBREE, sworn, says: In the performance of my duties as Supervising Inspector of Steamboats, I went to the wreck of the *Timour*, No. 2, near Jefferson City, Missouri, to make a personal examination; all the boilers, three in number, had exploded; the main deck of the boat, from the forward boiler beam to the cylinder timbers, a space of about thirty feet, was completely broken; the plank shears and guards for that length were also broken or blown overboard; the lattice bulkhead and string piece that supported the beams were also broken away, and I have reason to suppose that some of the planks of the hull were blown off, as it is in evidence that the boat sunk immediately; it is shown that nearly the whole force of the explosion was upwards and downwards; the main deck, cabin floor, hurricane deck, and officers' rooms, (Texas,) were all cut off nearly even with the cylinder timbers, or only a few feet back of where the boilers stood; the forward part of the boiler deck, part of the hurricane deck, and the chimneys, I am informed, were thrown upon the fore-castle; the decks, beams, cabins, and every part of the wood work under and over the boilers, appear to be literally broken up into splinters; parts of some of the boilers and flues are scattered about the shore and deck; some pieces of the flues are flattened, and others are not so; the after-head of the starboard boiler lies upon the deck between the cylinder timbers, with parts of the flues and more than one ring of the boilers attached; the forward heads of the boilers being of cast iron, are much broken; the flues of the middle boiler, with part of the after-head attached, are across the boat near the cylinder timbers, the one pointing to the shore, and the other into the river. Part of the after-head of the larboard boiler is on shore, with some of the shell attached; two large fragments of this boiler were thrown upon the bluff, equal to about six sheets, and weighing, by estimate, 450 pounds. It struck a tree, as near as could be judged, 200 feet in height, and in a horizontal direction, 160 yards from the boat; the other, which would weigh about 150 pounds, was 20 or 30 feet nearer the

boat; one large fragment of iron, containing about the equivalent of four sheets, was in the hold of the boat; it had been torn open at the bottom of the boiler; all the large fragments examined, with one exception, were also torn open at the bottom of the boilers; the stand pipes were broken short off at the cross or supply pipe; the mud receivers and safety valve were not found; the doctor was overset, but not broken; the valves were all examined, and found in good order; the heavy line scales were generally thrown off of the iron where there was a flattening of flues, or straightening of the shell; but on some parts of the bottom of the shell of the boilers, I found heavy lime scales, which I judge to be between one-eighth and three-sixteenths of an inch thick; these were what we steambotmen called low-water scales; the flues that were not flattened were heavily coated with lime. I saw no water line, or mark of low water on the flues, or on the head of the boiler on the deck of the boat. I suppose if the water had been low in the boilers, the lime scales in the tops of the flues would have shown it; but I heated a part of a flue that was heavily coated with lime until it burnt a wad of wet hemp to ashes, and it appeared to have no effect upon the lime scales. The lime seems to adhere to the iron as paint does to wood; this is the low-water lime scale; the high-water lime scale is more rough and porous. I brought away some pieces of the iron of the exploded boilers, but have not yet had time to have its strength tested. I have the promise of the exact height and distance from the boat to where the fragment of iron struck the tree, by the Superintendent of the Pacific Railroad.

"From the facts in evidence in this case, we must draw our conclusions as to the cause of this melancholy disaster. It is an extraordinary occurrence, the time being just after stopping the boat, is unusual; had it occurred on starting the boat, after it had been lying some time at shore, we might attribute it to the accumulation of surcharged or unsaturated steam, as fully treated upon in the *Western Boatman*, to the adhering of the safety valve by glutinous matter, or to some other such cause; but in this case there was not time to accumulate an undue head of steam, if the evidence be true. There was no evidence of a want of water, unless the fact that there was an explosion be that evidence, which I cannot admit in all cases; although I admit it is the general cause of explosions. In this case there is direct and positive testimony of there having been plenty of water in the boilers. This is supported by the fact that there was not a person on board, be his experience great or otherwise, that noticed any change or variation in the sound of the steam whatever; they were all as unconscious of danger as we are now, sitting in this room; we must, therefore, look to some other cause for the event. I cannot agree with the witness, Chappell, that it was an instantaneous and unaccountable accumulation of power; if so, steam is not under human control, even for ordinary purposes. Every effort should be made, and every faculty of the human mind exerted to its utmost tension, before we come to such conclusion. First, then, is there any necessity for looking for greater force than is admitted to have existed in the boilers of the *Timour*, No. 2, at the time of the explosion, to account for all the results that followed? There were three boilers, each 28 feet long, and 40 inches in diameter, with a pressure of 150 pounds to the square inch; 40 inches in diameter is 120 inches in circumference; 28 feet is 336 inches in length; these, being multiplied, make 42,000 square inches; multiplied by 150 pounds to the square inch, makes 6,300,000 pounds for one boiler, and for three boilers makes 18,900,000 pounds, or 9450 tons. There were, then, 9450 tons of pressure chained within the boilers of the *Timour*, at the time of her landing. If we can show that this tremendous force was instantaneously let loose upon the deck of the boat, will it not account for all that we have seen? If we deduct the one-half, three-fourths, or even eight-ninths of this force, as having escaped sideways and endways, we have yet more than a thousand tons of direct force to mash the deck of the boat to atoms, and send fragments of the boiler 200 feet high and 160 yards horizontally. That the boilers of the *Timour* did split open at their bottom, is evidenced by the force of the steam having operated upward and downward, and not endways to any great extent; that the explosion was almost instantaneous, is gathered from the fact that most of the persons on board recollected but one tremendous shock, while others think there were two shocks or concussions. The latter I think probable, and that the middle boiler first gave way. It would in that case drive the others outward, and tear them from the fastenings to the mud-receiver and cross-pipe. When the boilers were thus fractured, they may have torn from end to end in a single instant, because the whole force of the steam in that direction would be applied to break fibre after fibre, like the tearing of cloth, thread by thread, making no difference with what speed it would be effected. I draw this conclusion from the direction in which the large fragments of the larboard boiler were thrown upon the bluff, while the starboard boiler, with the exception of the after-head, was probably

thrown into the river. The shell of the middle boiler was thrown, no one knows where, while the flues of it were thrown in opposite directions, and now remain fast to part of the after-head, upon the boat. These things indicate an almost exact upward and downward tendency of the force, and a balancing of the materials upon which it operated; I therefore believe that the cause of the explosion was the injury of the iron of the bottoms of the boilers by being covered with lime, a partial non-conductor of heat; the iron when thus exposed has the fibre destroyed, and becomes granulated or crystallized and weakened, and that the boilers give way in the weakest part.

Cross-Examined.—States that the quantity of steam allowed on the steamer *Timour*, No. 2. was 150 pounds to the square inch, as appears by the certificate of Inspectors; the boilers on this boat were one grade thinner than usual, though not so thin as many that have passed inspection; I profess to be an engineer, though never acted regularly in that capacity on a steamboat; it is some ten or twelve years since I have been on the river as boatman at all; I never was engaged in boating on the Missouri river; boilers used on the Missouri river are more liable to be injured or affected by lime scales than other waters with which I am acquainted; scales will constantly be forming in navigating the Missouri river, unless there be some remedy applied to prevent it; the giving away of the boilers, or any one of them, in any portion or part, with the usual head of steam, might have produced an explosion, and the appearance of the wreck just the same as made by the explosion in this case.

(Signed,)

DAVIS EMBREE."

To show the competency of the men employed, we have the testimony of an assistant engineer, that—

"I do not believe that the explosion took place from a gradual increase of pressure, but from an instantaneous pressure caused by some means which has never been discovered." "I do not think it possible for any gradual increase of steam to have torn a set of boilers into so many irregular shaped fragments."

On the strength of this evidence, the U. S. Commissioner decided to discharge the defendants, "the said evidence not being sufficient to show that they or either of them were guilty of inattention, negligence, or misconduct, in the discharge of their duties."

What use, then, of making laws, the administration of which is to result in such a solemn farce? If these engineers were not guilty, then what must an engineer do or neglect, in order to convince the Commissioner of his guilt?

*Vulcanized Stone.**

A fresh invention has been patented for hardening the soft stones of the country. Specimens have been exhibited of great hardness, susceptible of high polish, which preserve a sharp aris, and are stated to be proof against the alternations of our climate, and to withstand not only the London atmosphere, but even the action of the strongest acids. The proprietors allege that, by a solution, chemically prepared, and laid on with a brush in dry weather, the decay of old buildings may be arrested; and the material acted on, whether stone, compo, or brick, be made perfectly non-absorbent.

The specification says,—“It is proposed (in all cases where it is practicable) in applying any indurating mixtures, to inclose the stone or other materials to be operated upon in an air tight chamber, and exhaust, or partially exhaust, the same, and then allow the indurating substance, whether hot or cold, to trickle down, or flow into the chamber, to fill the vacuum, the effect of which will be that the liquid indurating substance will readily find its way into the pores of the stone or other material, and become incorporated therewith.

* From the London Builder, No. 576.