

smaller vessel could lay close aboard and by her heavy guns greatly damage her enemy, while she would be comparatively safe by reason of the small target presented. We speak not from prejudice but upon conviction. We have watched the career of these vessels as well as our contemporaries and we venture to think we are as ready to condemn them as they. We have been on board the vessels after the attack on Charleston, and subsequently, but we invariably found that, for reasons best known to the authors, the reports of their inefficiency and injuries were greatly exaggerated.

We have no desire to bolster up any vessel or any enterprise that is unworthy of public confidence, but the merits of the monitors far outweigh their defects, and until some other plan is proved better worthy of consideration we shall continue to advocate their cause whenever and wherever it is attacked, at home or abroad.

THE HECKER AND WATERMAN EXPERIMENTS.

We give this week an account of four experiments tried between the 12th of May and the 4th of June, the space around the thin walls of the cylinder being heated with steam from the boiler, the exhaust steam being condensed. The four points of cut-off were the same in all the experiments. The following are the figures:—

Total number of revolutions of the engine during each 30-hours run—

3/4ths cut-off	77,726
2/3ds cut-off	77,762
1/2 cut-off	77,763
1/4th cut-off	77,624

Total number of the revolutions of the fan—

3/4ths cut-off	123,289
2/3ds cut-off	123,188
1/2 cut-off	123,348
1/4th cut-off	123,134

Total number of pounds of water evaporated—

3/4ths cut-off	12,901
2/3ds cut-off	11,267
1/2 cut-off	11,188
1/4th cut-off	9,032

Total number of pounds of steam condensed in the steam jacket—

3/4ths cut-off	463
2/3ds cut-off	450
1/2 cut-off	486
1/4th cut-off	532

Total number of pounds of combustible consumed, adding coal and wood together and deducting the ashes—

3/4ths cut-off	1,212
2/3ds cut-off	1,069
1/2 cut-off	1,086
1/4th cut-off	959.5

Number of revolutions of engine per minute—

3/4ths cut-off	43.181
2/3ds cut-off	43.146
1/2 cut-off	43.239
1/4th cut-off	43.124

Vacuum in condenser in inches per open gage—

3/4ths cut-off	27.29
2/3ds cut-off	27.28
1/2 cut-off	27.70
1/4th cut-off	27.19

Mean height of barometer during each run—

3/4ths cut-off	29.80
2/3ds cut-off	29.89
1/2 cut-off	29.62
1/4th cut-off	29.97

Mean temperature of water discharged by air-pump during each 30-hours run—

3/4ths cut-off	94.83
2/3ds cut-off	94.32
1/2 cut-off	93.16
1/4th cut-off	104.38

Mean temperature of feed-water—

3/4ths cut-off	95.92
2/3ds cut-off	95.53
1/2 cut-off	90.36
1/4th cut-off	101.54

Mean temperature of engine-room—

3/4ths cut-off	72.32
2/3ds cut-off	76.58
1/2 cut-off	77.09
1/4th cut-off	77.12

Mean steam-pressure in boiler per gage—

3/4ths cut-off	25.13
2/3ds cut-off	25.41
1/2 cut-off	34.64
1/4th cut-off	47.51

Mean pressure in cylinder above full vacuum at beginning of stroke—

3/4ths cut-off	28.714
2/3ds cut-off	30.976
1/2 cut-off	36.181
1/4th cut-off	47.02

Mean pressure at point of cut-off—

3/4ths cut-off	26.022
2/3ds cut-off	27.016
1/2 cut-off	31.448
1/4th cut-off	41.62

Mean pressure at end of stroke—

3/4ths cut-off	23.506
2/3ds cut-off	18.688
1/2 cut-off	16.772
1/4th cut-off	14.083

Mean back pressure on piston—

3/4ths cut-off	3.540
2/3ds cut-off	3.380
1/2 cut-off	2.500
1/4th cut-off	2.45

Mean gross effective pressure—

3/4ths cut-off	23.413
2/3ds cut-off	23.761
1/2 cut-off	25.909
1/4th cut-off	24.116

Gross effective horse-power per indicator—

3/4ths cut-off	9.613
2/3ds cut-off	9.816
1/2 cut-off	10.760
1/4th cut-off	9.958

Total horse-power, including overcoming back pressure—

3/4ths cut-off	11.277
2/3ds cut-off	11.21
1/2 cut-off	11.754
1/4th cut-off	10.970

Net horse-power applied to fan, deducting back pressure and friction of engine—

3/4ths cut-off	8.52
2/3ds cut-off	8.577
1/2 cut-off	9.327
1/4th cut-off	8.719

Pounds of feed-water per hour per total horse-power per indicator—

3/4ths cut-off	38.130
2/3ds cut-off	33.481
1/2 cut-off	31.691
1/4th cut-off	29.261

Pounds of combustible per total indicated horse-power per hour—

3/4ths cut-off	3.583
2/3ds cut-off	3.179
1/2 cut-off	3.164
1/4th cut-off	2.306

It will be observed that an economy of nearly 25 per cent in fuel was effected by cutting off at 1/4th instead of 3/4ths, the same work being done in both cases in the same time. But in cutting off at 2/3ds and at 1/2 of the stroke, there was no material difference in the quantity of fuel. Next week we shall give an account of four 30-hour experiments, the engine being worked as a non-condenser.

MISCELLANEOUS SUMMARY.

FORTIFICATIONS.—The art of constructing earth-works has been wonderfully developed by our civil war. The Richmond papers speak of Butler's works at Bermuda Hundred as marvels of scientific intricacy. They consist of high earth-works, defended by a ditch twelve feet wide and a perfectly impenetrable abattis, the trees and branches composing the latter being thick interwoven with wire. According to the rebel account, had there been no garrison defending this work it would have taken the rebel troops two hours to get into the intrenchments. Some of Lee's works at Spottsylvania were nearly as formidable, rendered so chiefly by the ingenuity displayed in the abattis. Grant's works in the siege of Vicksburg were wonders of engineering skill.

CAUSE OF THE EXPLOSION OF GUN-COTTON AT STOW-MARKET.—The inquest on the two girls who lost their lives at the gun-cotton factory at Stowmarket, England, has concluded. It appears that the injury was caused by the ignition of the girls' dresses and not by the explosive force of the cotton. The ignition of the gun-cotton evidently arose from the heat produced by friction, possibly by some grit having got into the cartridge. The absurdity of Dr. Phipson's suggestion (published in the *Times* of June 18th), that it was caused by electrical action, is proved by the fact that the most powerful electrical sparks can be sent through a mass of gun-cotton without igniting it.—*London Mining Journal.*

The great Iron Company of Marseilles have just completed, at their dockyard at La Seyne, near Toulon, an iron-plated steam gunboat on a new model. It has already been tried, and the result was most satisfactory. It may be easily separated into eighteen pieces, and each of these forms a small boat, which may travel over land or navigate the sea with equal facility. The gunboat, when entire, accomplished eight and a half knots an hour. When taken to pieces a whole fleet of gunboats may be moved from one place to another by railway at the rate of thirty-five miles an hour.

HARVEY'S theory of the circulation of the blood, or rather the causes of the circulation, is beginning to be disputed; for blushing, sudden paleness of the face, flushing and chilliness of the body, frequently occur without any disturbance or modification of the heart's action. The steady movement of the blood in the capillaries, the circulation through the liver without the intervention of any propulsive force, the fact that after death the arteries are usually found empty, among other things, cannot be accounted for on the hypothesis that the heart is the sole mover of the blood. The new theory is that the action is a chemical one.

FORTUNATE ESCAPE.—Dr. S. G. Martin, of Syracuse, says that he made an engagement some weeks since to administer nitrous oxide gas to an elderly lady, for whom he was going to extract some teeth preparatory to making an upper set; but fortunately, as it turned out, the teeth had to be extracted without the use of the gas in consequence of the failure of an assistant to have it ready. The next day the lady was seriously ill with congestion of the lungs, and barely escaped death. The congestion would have been attributed doubtless to the effects of the gas had she taken it, and that she did not, may be set down as a fortunate accident for the doctor.

EXTRAORDINARY TIMBER. A lot of choice timber, such as we sometimes "read of," but seldom see, has been lying at the Michigan Central dock, Detroit, awaiting shipment. It is principally black walnut, and was cut in the vicinity of Dowagiac. One of the sticks is 57 inches square, and a number of others are very nearly equal in size. Owing to the formidable size of the trees, wood-choppers long hesitated about "going in," but finally, under the temptation, we suppose, of the "high price of gold," the monarchs of the forest were laid low. They afford a fair example of what Michigan can do in the way of native productions.

A BRAVE ENGINEER.—A gentleman just returned from a trip to the West informs us, that while on a train some thirty miles from Chicago, the engineer, on approaching a bridge, discovered a child struggling in the water. With most heroic courage he instantly gave the signal for stopping the train, then running at a speed of thirty-five miles an hour, and jumped from the locomotive into the water. When the train had stopped, the brave fellow had rescued the child and was climbing up the bank of the river with it in his arms. The name of this brave engineer is Charles N. Thompson, and he is a native of Taunton, Mass.

JUST AS THE TWIG IS BENT.—Lord Shaftesbury recently declared at a public meeting, as an ascertained fact, that forty-nine out of fifty of all the criminals in England, convicted in after-life, commenced their career of crime between the ages of eight and sixteen; so that he who has passed through his sixteenth year, without having begun a life of crime against the laws of his country in some particular or other, is almost certain never to do so. But the statistics may be somewhat different in America.

The custom-house officers of San Francisco have discovered a very ingenious Chinese trick, which led to the seizure of a lot of smuggled opium. Among a cargo were 400 tubs invoiced as eggs, value stated at one dollar each. The eggs were coated with a peculiar kind of varnish to preserve them. One of the officers, in examining the eggs, scraped off a little varnish and disclosed a metallic case, egg-shaped, filled with opium. Each metallic egg is worth \$300. There was a thousand of them.

The town of Wilna is to be lighted with gas from pine-wood. The basins will contain 60,000 cubic feet of water. The gasometer, of cast-iron, will be of the same capacity. The plan exhibits three distinct edifices for the distillation of gas, its purifications, and distribution. Forty-nine towns in Germany, Hungary, Italy, and Switzerland, and quite lately Helsingfors, owe their lighting to gas distilled from wood or jutesal.

LIVE AND DEAD WEIGHT OF SHEEP.—The English rule is to weigh sheep when fattened and divide the weight by 7 and call it quarters. Thus a sheep weighing 140 pounds, would give 20 pounds a quarter as dead weight. If the sheep are in good condition this rule is sufficiently accurate for all purposes. Poor sheep will fall below the mark, and extra fat ones go over it.

A MECHANICAL NOVELTY.—Mr. Barnum has recently added a mechanical novelty to his Museum, which consists of a case 4 feet 6 inches high, 3 feet wide, and 2 feet thick, which contains two hundred varieties of elaborate, full-sized, strong, and useful pieces of furniture of various kinds, all compactly stowed away.

A SUBSTANTIAL REWARD.—It is stated that by naval laws, when an inferior vessel sinks a superior one, her entire value goes to the victors. The *Alabama* being estimated to be worth \$500,000, Capt. Winslow will be entitled to from \$70,000 to \$100,000, while the seamen will get from \$1,200 to \$1,500