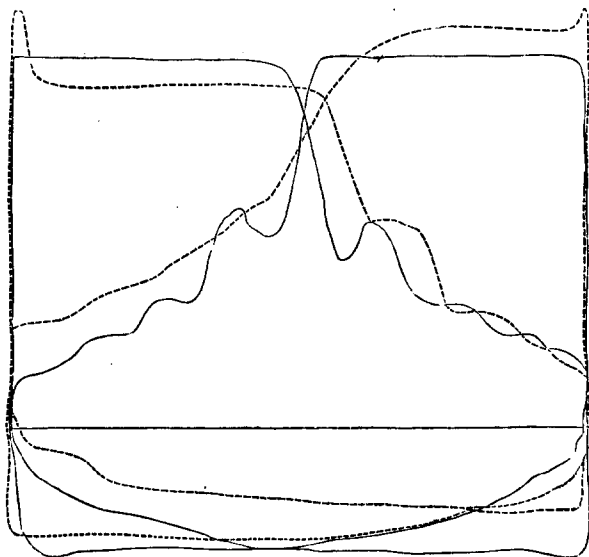


is a specimen of indicator diagrams taken at the above speed. Date May 30th, 1860, 2 hours 30 minutes, P. M.

	After Engine. (full lines.)	Forward Engine. (dotted lines.)
Revolutions per minute,	35	35
Pres-ure of steam,	32	32
Vacuum,	25	25.5
Throttle,	Wide open.	Wide open.
Mean pressure,	29.16	28.8
Horse power,	578.43	571.29



An abstract from her log shows a consumption of 2.81 lbs. of coal per hour per horse power. The contract specified that the consumption should not exceed 2.9 lbs.

Armament.—Two 11-inch pivot guns and four 32-pounder guns.

The *Dacotah* is now attached to the squadron for the East Indies and China Seas.

J. H. W.

For the Journal of the Franklin Institute.

Power required to Overcome the Resistance of the Feed Pumps of the U. S. S. Frigate Powhatan. By WM. H. SHOCK, Chief Engineer, U. S. Navy.

I was anxious to ascertain with some degree of certainty the amount of power required to overcome the resistance of the feed pumps of the *Powhatan*, and, as preliminary to that investigation, the annexed plate of diagrams was taken under different conditions of the check valves on the boilers, as follows :

Check valves wide open.

“ at usual working point.

“ close shut.

I deemed these three points sufficient for the investigation, thinking that any deviation from them in practice would not materially modify

the result. In this I was correct, as will be seen upon examination of the diagrams, and the tabulated H. P. deduced therefrom.

The average pressure of steam, revolutions, &c., &c., were taken from the daily engine diagrams, and were as follows:

Steam per gauge,	11½ lbs.
Revolutions per minute,	93 "
Vacuum,	25 inches.
Hot-well,	120°

DIMENSIONS OF PUMPS, &C.

Diameter of pumps,	8 inches.
Stroke of "	42 "
Diameter (internal) of feed pipes,	4½ "
Weight on safety feed valve,	294 lbs.
Pressure per square inch on safety feed valve,	20.7 "

From diagrams 1, 2, 3, &c., Plate I, it is found that the power necessary to overcome resistance of feed pumps was as follows:*

No. 1 = 1.12 horse powers.	
" 2 = 1.19 "	
" 3 = 1.58 "	} Check valves at their usual working lift.
" 4 = 1.48 "	
" 5 = 1.73 "	
" 6 = 1.54 "	

Mean, 1.44 "

As the investigation was to ascertain more particularly the power absorbed by the pumps under their normal working condition, we shall use those diagrams only which were taken at that time, and assume their mean resistance to be the measure of power absorbed by each pump, as follows:

No. 3 = 1.58 H. P.
" 4 = 1.48 "
C = 1.52 "
D = 1.70 "

Mean, 1.57 "

And $1.57 \times 4 = 6.28$ H. P. as the total resistance of the four pumps. The engines at the time were developing 527.58 H. P., 6.28, or 1.19 per centum, of which was being absorbed by the feed pumps.

Diagrams A, B, C, &c., were taken under nearly the same conditions of steam, revolutions, &c., &c.

The following tabulated statement shows the pump resistance as determined by each diagram on that day:*

A = 1.23 horse powers.	
B = 1.26 "	
C = 1.52 "	} Check valves at their usual working lift.
D = 1.70 "	
E = 1.58 "	
F = 1.91 "	

Mean, 1.53 "

When Plate of diagrams A, B, C, &c., was taken, the engines were developing 600 horse powers, 1.045 per centum of which was exhausted in overcoming the resistance of the pumps.

* It will be observed that the *friction* resistance of the pump plungers, is not an element in the above calculations, not because it was of no importance, but simply from the fact that it was impossible to arrive at a correct estimate of its value. In properly managed pumps, however, loss from this source would be comparatively small.

Port.

Check valve wide open.

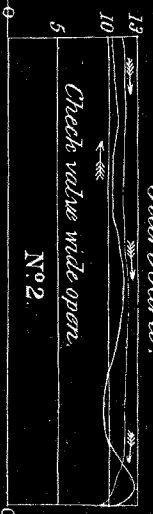
Nº 1.



Starboard.

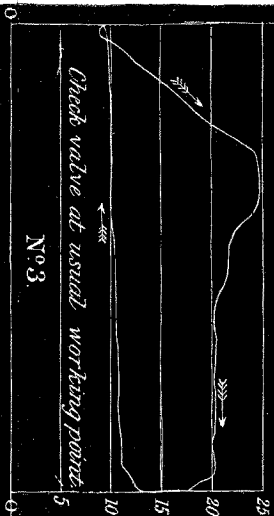
Check valve wide open.

Nº 2.



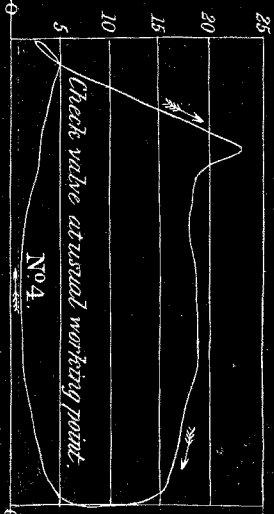
Check valve at usual working point.

Nº 3.



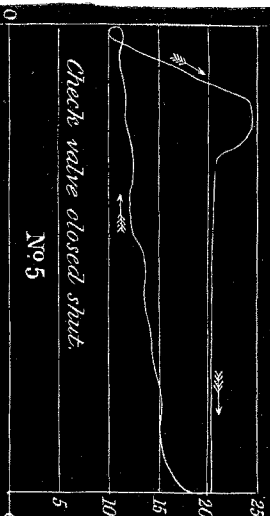
Check valve at usual working point.

Nº 4.



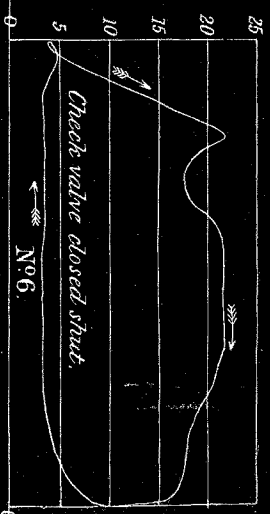
Check valve closed shut.

Nº 5.



Check valve closed shut.

Nº 6.



Scale 1 2 3 4 5 10 15 lbs.

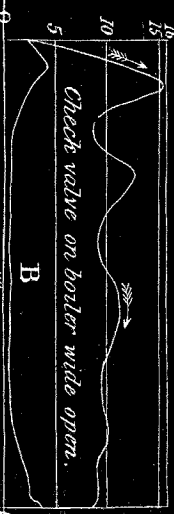
Check valve on boiler wide open.

A



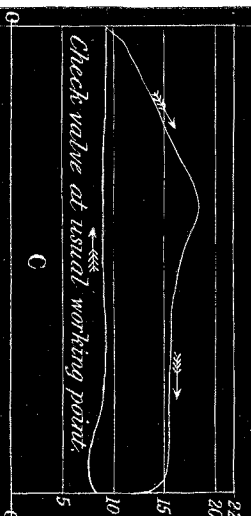
Check valve on boiler wide open.

B



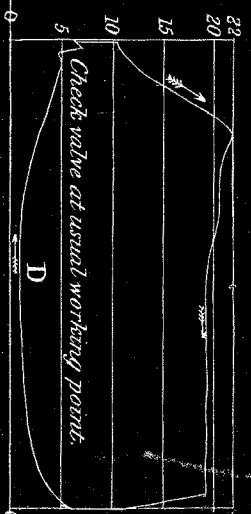
Check valve at usual working point.

C



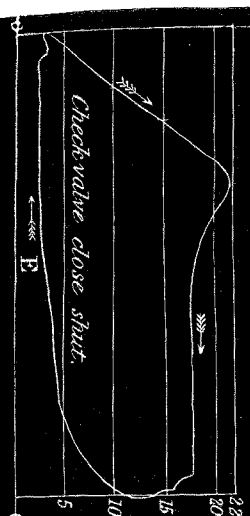
Check valve at usual working point.

D



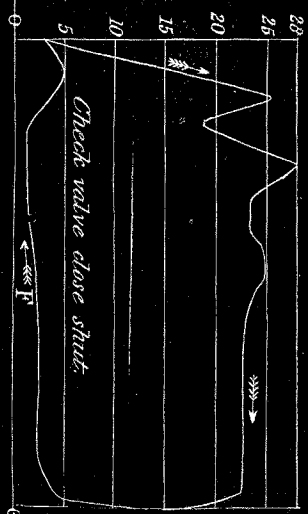
Check valve close shut.

E



Check valve close shut.

F



Diagrams from Feed Pump U. S. Steamer Powhatan.

Results of Experiments on the Tensile Strength of Copper, Iron, Gun Metal, Yellow Metal, and Bolts. Made at the U. S. Navy Yard, Washington, D. C., by W. M. ELLIS, Engineer and Machinist. Tabulated and Reduced by C. H. HASWELL.

No. of Test.	Material.	Diameter.	Length.	Reduction of diameter.	Extension of length.	Breaking Weight.	Mean Strength.	Cohesive strength per sq. inch.
		Inch.	Feet.	Inch.	Inch.	lbs.		
1	Copper.		3		1	10,400	11,900	38,567
2	"		3	$\frac{1}{8}$	1	12,100		
3	"		3	$\frac{1}{8}$		13,200		
1	"		3	$\frac{1}{8}$		15,700	17,600	39,820
2	"		3			18,100		
3	"		3	$\frac{1}{8}$		19,000		
1	"	1	3	$\frac{1}{8}$		29,900	29,700	37,834
2	"	1	3	$\frac{1}{8}$		29,700		
3	"	1	3			29,500		
1	"	$1\frac{1}{8}$	3			26,400	29,600	29,780
2	"	$1\frac{1}{8}$	3			32,400		
3	"	$1\frac{1}{8}$	3			30,000		
1	"	$1\frac{1}{4}$	2			41,000	41,833	34,093
2	"	$1\frac{1}{4}$	2			41,500		
3	"	$1\frac{1}{4}$	2			43,000		
1	Iron.		3	1-16	4	16,800	17,066	55,590
2	"		3	$\frac{1}{8}$	4.5	17,300		
3	"		3		4.5	17,100		
1	"		3		1.75	21,500	24,500	55,429
2	"		3			24,100		
3	"		3	1-16		27,900		
1	"	1	3	$\frac{1}{4}$	5.5	43,100	41,533	52,908
2	"	1	3			39,900		
3	"	1	3			41,600		
1	"	$1\frac{1}{8}$	3			44,000	44,866	45,136
2	"	$1\frac{1}{8}$	3			50,000		
3	"	$1\frac{1}{8}$	3			40,600		
1	"	$1\frac{1}{4}$	2	1-16	2.5	62,600	64,200	52,322
2	"	$1\frac{1}{4}$	2			64,200		
3	"	$1\frac{1}{4}$	2			65,800		
1	*Gun metal.	1	3			15,300	13,550	17,388
2	"	1	3			11,800		
1	† Yellow metal.	$\frac{5}{8}$	3		3	15,000	15,750	51,302
2	"	$\frac{5}{8}$	3	$\frac{1}{8}$		16,500		
1	"	$\frac{3}{4}$	3	9-16	3	25,800	23,000	52,036
2	"	$\frac{3}{4}$	3			21,500		
3	"	$\frac{3}{4}$	3			21,700		
1	"	1	3	$\frac{1}{8}$	9	44,500	40,500	51,460
2	"	1	3	$\frac{1}{8}$		38,800		
3	"	1	3	$\frac{1}{4}$		38,200		
1	"	$1\frac{1}{8}$	3			45,800	43,600	43,983
2	"	$1\frac{1}{8}$	3			41,400		
1	"	$1\frac{1}{4}$	2	1-16	3	58,200	55,066	44,878
2	"	$1\frac{1}{4}$	2			46,200		
3	"	$1\frac{1}{4}$	2	3-16		60,800		

* 9 Copper, 1 Tin.

† "

Mean results of above,

Copper,	36,000 lbs.
Iron,	52,250 "
Gun metal,	17,400 "
Yellow metal,	48,700 "