VOYAGE REPORT

S/S "NORWAY" - Testing of Combustion Air Rate
June 18th until June 25th, 1983

The objective and purpose was to find out whether there is possibility to operate boiler with 6 ton/h fuel oil, and to determine the required air rate for such operation. Original rating, after conversion in 1979/80, was 5.4 ton/h and 3-boiler operation.

Having made various adjustments of the fuel oil/air ratio, it was found that the blower transferred air rate was very low and out of regulating-type range. The cause of it are the new IOWA registers installed which make for some serious pressure loss between windbox and furnace.

There were two alternatives to achieve increase in combustion air rates:-

1) Reducing in size of the impeller in the IOWA register.

2) Lengthening of blade in blower impeller.

Faced with the impossibility to obtain any theoretical determination how to bring about increase of air rate by way of computation, due to missing documentation and particulars, so experiments had to be performed to find out the most effective approach.
For that reason, among others, smaller-sized impellers of 305 mm diameter were also taken aboard.

Consideration had to be given to the flame length with full boiler load; fuel oil rate of 6 ton/h. Larger burner nozzles 6Y 43-52-47 were provided in this respect.

Upon testing the impeller and the motor loading capacity, blades of the impeller were extended by 52 mm to achieve an increase in pressurization and, consequently, increased delivery rate.
A test run of blowers, without fire, showed some considerably higher pressurization with same position of flaps, as against the reference measurement taken on No. 22 boiler blowers.
Balancing of rotors was not required to be done on completion of lengthening, as loads were very carefully and evenly distributed and blowers had shown smooth operation on trial run.
The test run with fire and new burner nozzles also indicated a sufficient air rate at 6 ton/h fuel oil. In comparison to the reference reading of July 1982, there was a larger amount of air delivery and, with smokeless flame, 6 ton/h fuel oil could be burnt.

Also measurement of air distribution at registers was done using "Brandel" pipe. Such test showed that burner No. IV got slightly more air than the remaining units which had even distribution.
Length of flames was also found in good order.
With full load at boiler, flame tips are only temporarily touching boiler rear wall.

The lengthening as carried out and the values obtained from test runs will be verified by Messrs. Babcock by way of computation. If the measured readings were confirmed it would be required to lengthen all of the blower impellers similarly. Such procedure could be done in conjunction with the intended installation of new fuel oil regulating valves. Then the fuel oil/air ratio should be adjusted to its best possible figure.

However balancing, cleaning and overhaul of blowers should necessarily be carried out on completion of refit. In addition, improvement should possibly be reached with the articulation of blower flap actuators. And also existing O_2 gauge should be overhauled so as to obtain optimum O_2 values in operation. A CO_2 test performed with the "Orsat" unit showed 12 % CO_2 which is a non-acceptable reading in consideration of today's requirements for fuel saving.

For 2-boiler operation it would be required to re-adapt boiler regulation to the turbine remote control, particularly with regard to astern movement.
The flue gas turbidity unit should be connected to the alarm system via an additional relay to obtain immediate indication in case of flue gas turbidity.

As a result of the test run it has been found that it is possible to burn 6 ton/h fuel oil after conversion of blowers.

During the final meeting with owners, I was requested by Mr. Borresen to see to it that an estimate for opening of high pressure turbines be prepared, with regard to modification of nozzles. The price quoted by AG Weser in May 1982 seemed very high to him. Also the installation of shut-off valve for the 6-nozzle group to be quoted for. An overall tender was made up by AG Weser in May 1982 in conjunction with a calculation about fuel oil saving.

For the intended conversion of fuel oil regulating valves I should like to make an arrangement with Messrs. Siemens as to time and procedure, and submit an evaluation of the intended proceedings to Mr. Borresen.

In any other respect he expressed his satisfaction about our test run and its results.

Bremerhaven, June 27th, 1983 / We. signed S a t o w

CERTIFIED TO BE A TRUE COPY ,LTSG,OSCG,IO P9. 2 of 11

Gebläsemessungen Kessel 23 mit Feuer

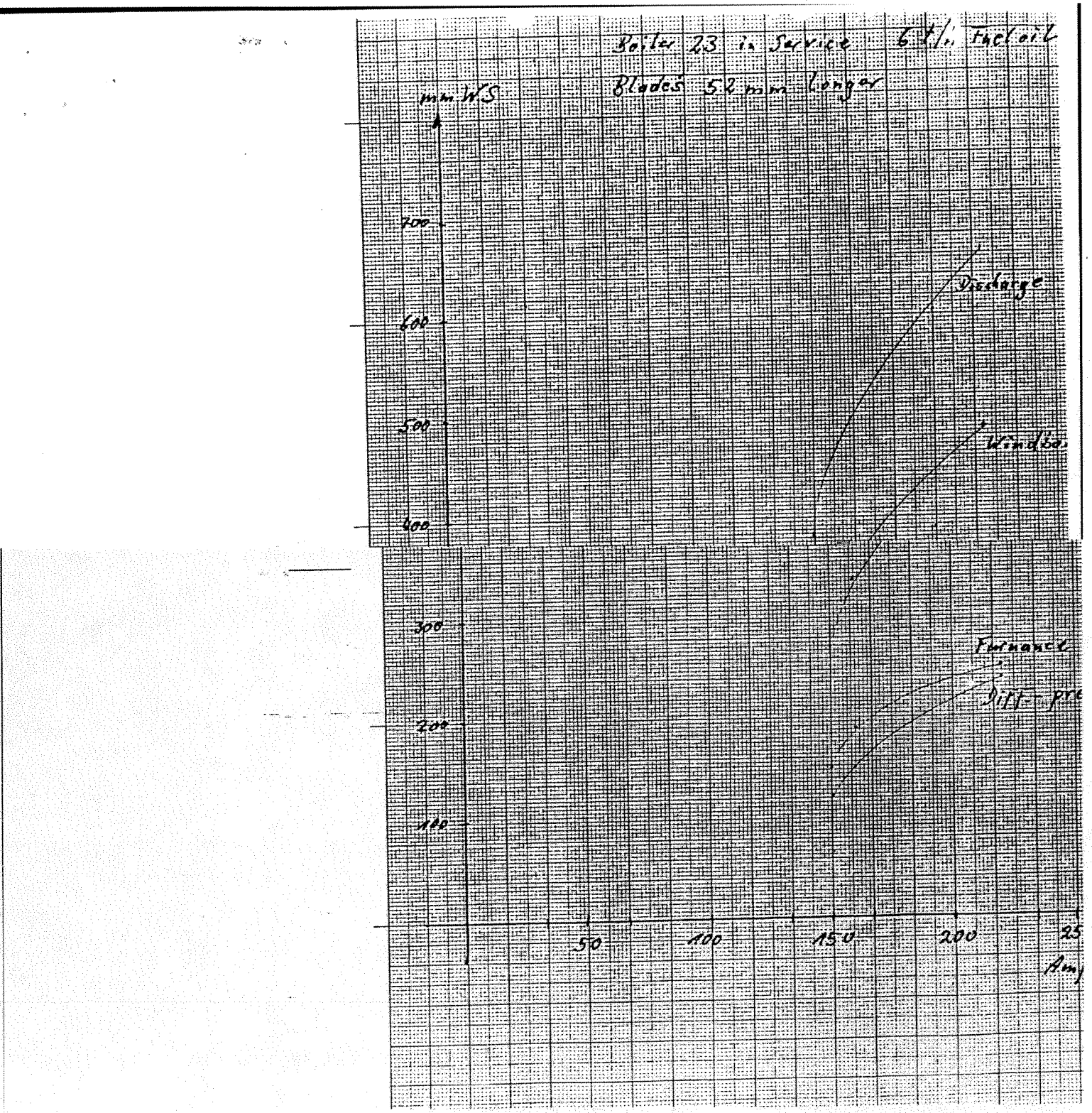
Klappen Stellung	Luft Leitgerät	Gebläse Last	Brennstoff	Leitgerät	Brennstoff Uhr	Druck am Gebläse					O_2	Druck Brenner		Datum: 22.06.85	Bemerkung
						Druck-seit.	Windb.	Feuerr.	Saugs.	Diff.dr.					
x	%	Amp.	%	t/h	Ltr.	mm WS	mm WS	mm WS	mm WS	mm WS	%	bar		°E	Druck bar
				Schaufel verlängert: 52 mm,						6 t/h	Heizöl, 2 Gebläse				
22/20	50	140/160		4		360/410	270	150		120	4,9	11,3		2,8	28,5
30/25	58	150/170	80	4,8		450/490	335	190		155	2,3	12,9		2,8	28,5
52/45		190/210	90	5,6		620/590	390	225		200	2,6	14,0		2,8	28,5
75/70	100	210/230	100	6,0		650/680	490	250		240	2,2	14,8		2,8	28,5
				Verbrennungsluft am Ratio um -5% reduziert											
				90% Stellung Leitgerät, Verbrennung rauchfrei											
				Dynaton O_2-Messung: 1,6%											
				Orsat - CO_2: 12% ≙ noch Reste 4% O_2											
				Brennerdüsen neu: 6Y - 43 - 52 - 47											

Gebläsemessungen Kessel 23 mit Feuer

Klappen Stellung	Luft Leitgerät	Gebläse Last	Brennstoff	Leitgerät	Brennstoff Uhr	Druck am Gebläse: Druck-seit.	Windb.	Feuerr.	Saugs.	Diff.dr.	O_2	Druck Brenner		Datum:	Bemerkung
		Amp.	%	t/h	Ltr.	mm WS	mm WS	mm WS	mm WS	mm WS	%	bar		V.St. E	Br. Pr. Druck
X				Schaufel var		Längsf: 52 mm				4,5 t/h		Heizöl	1 Gebläse	22.06.23	
60	80	230	70	3,8		330	245	140		110	3,3	11,5		2,8	22,5
78	100	280	75	4,5		375	290	160		140	2,1	12,5		2,8	29,0

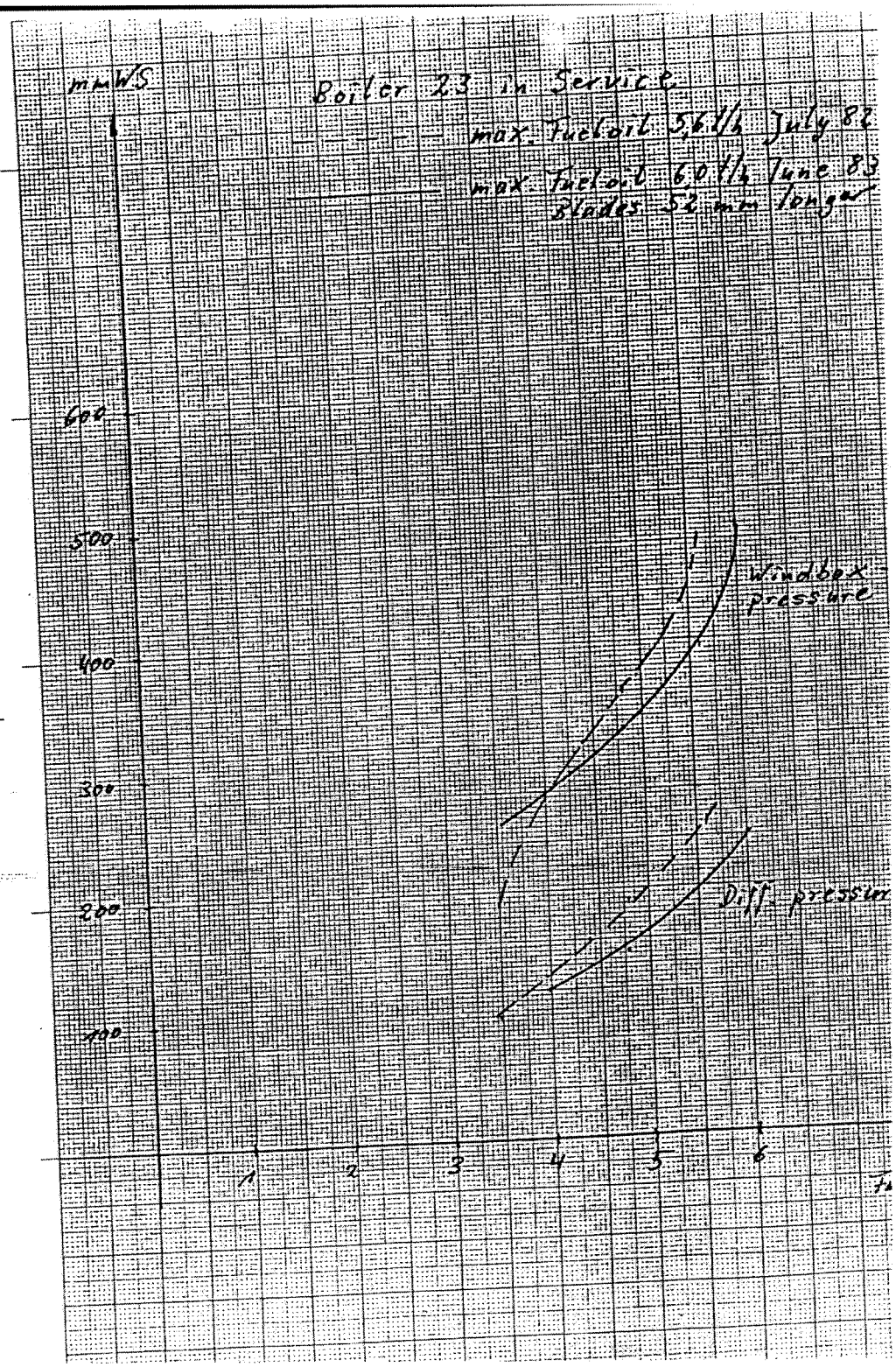
CERTIFIED TO BE A TRUE COPY

1 LTJG, USCG, IO



CERTIFIED TO BE A TRUE COPY

Lee D, LTJG, USCG, IO Pg 5 of 11



CERTIFIED TO BE A TRUE COPY

J.D., LTJG USCG, IO pg. 6 of 11

Gebläsemessungen Kessel 22 ohne Feuer

Klappen Stellung	Luft Leitgerät	Gebläse Last	Druck am Gebläse: Druck-seit.	Wind.	Feuerr.	Saugs.	Diff.dr.	Datum:	Bemerkung
%	°	Amp.	mm WS	mm WS	mm WS	mm WS	mm WS		
			Schaufel v. Licht					23.06.85	
5	20	110	145	120	25		40		
22	40	125	280	250	130		100		
45	60	160	480	420	175		175		
70	80	190	540	480	205		220		
95	90	190	540	440	215		230		
95	90	190							

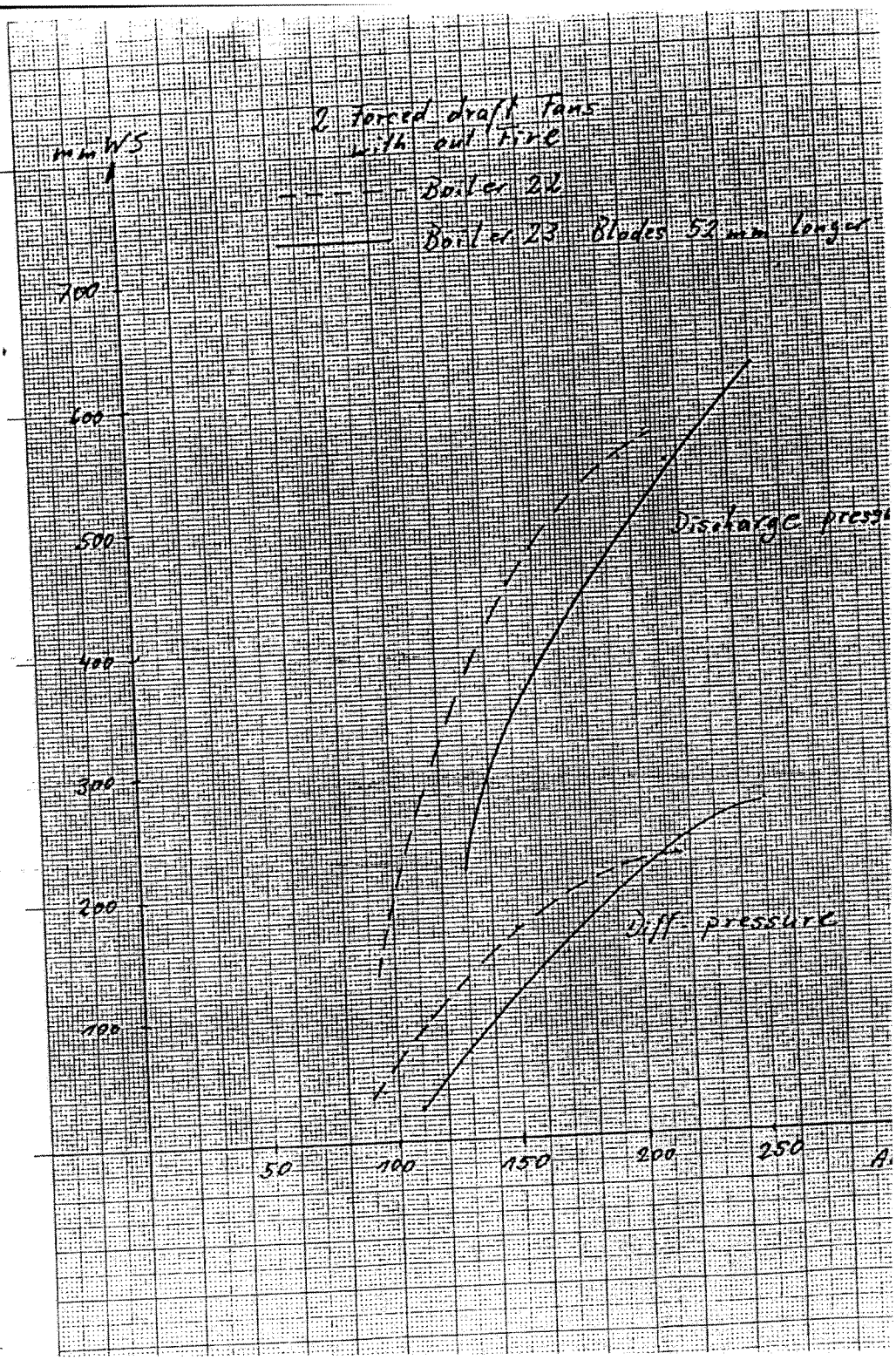
CERTIFIED TO BE A TRUE COPY

LTJG, USCG, IO

Gebläsemessungen Kessel 23 ohne Feuer

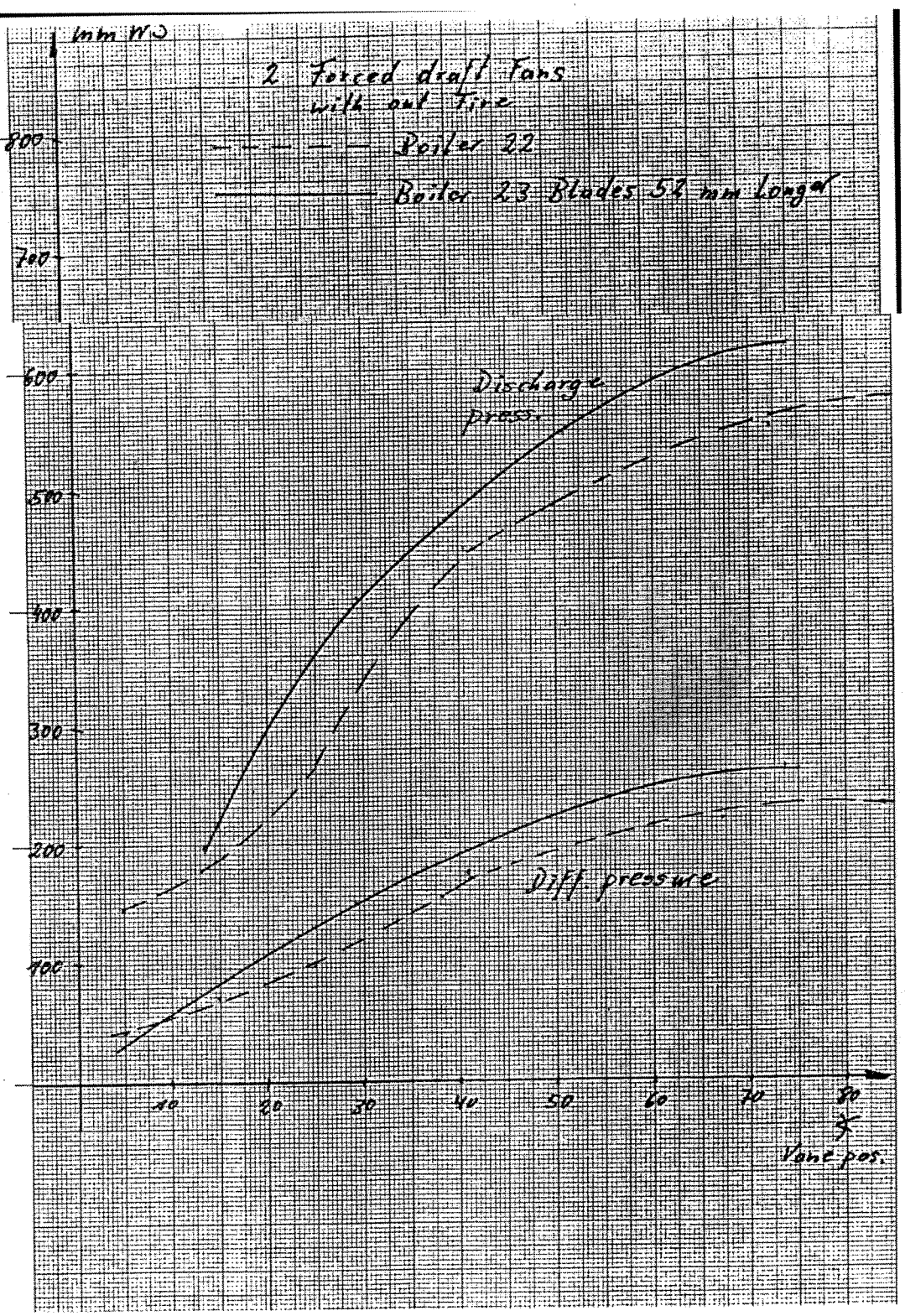
Stellung	Luft Leitgerät	Gebläse Last			Druck am Gebläse: Druck-seit.	Windb.	Feuerr.	Saugs.	Diff.dr.				Datum: 19.06.	Bemerkung
%	%	Amp.			mm WS	mm WS	mm WS	mm WS	mm WS					
				Schaufel verlängert:			52 mm		2 Gebläse parallel					
5	20/20	100/125				70	45		35					
15	40/40	120/140			220	130	65		67					
28	60/60	160/180			410	250	115		150					
48	80/80	210/220			550	365	150		220					
70	100/100	240/260			620	450	185		265					
				Verteilung Luft an Brenner:										
			Brenner I:	Brenner II:		Brenner III:			Brenner IV:					
			70 mm WS	70 mm WS			70 mm WS		78 mm WS					
			Brenner V:											
			70 mm WS											

das gilt für TO Pg. 8 of 11



CERTIFIED TO BE A TRUE COPY

LTJG, USCG, IO PG. 9 of 11



CERTIFIED TO BE A TRUE COPY

LTJG, USCG, IO Pg 10 of 11

Gebläsemessungen Messel 43 Gebläse Einsatz [illegible]

Klappen Stellung	Luft Leitgerät	Gebläse Last			Druck am Gebläse						Bemerkung
					Druck- selt.	Windb.	Feuerr.	Saugs.	Diff.dr.		
		Amp.			mm WS	mm WS	mm WS	mm WS	mm WS		Datum: 19.06.85
4	20	132			110	26	20		8		
12	40	140			130	46	36		12	Gebläse	
25	60	170			100	90	56		50	unten	
45	80	220				144	80		76		
70	100	280			310	185	90		100		
						30	20		13		
	40	100				85	48		40	Gebläse	
	60	140			150	150	75		80	oben	
	80	225			260	195	90		110		
	100	280			330						