

REPORT ON ELECTRICAL EQUIPMENT.

(OTHER THAN FOR THE PROPULSION OF THE VESSEL)

Received at London Office **27 OCT 1947**

Date of writing Report **29th July 1947** When handed in at Local Office **29th July 1947** Port of **NEW YORK**

No. in Survey held at **Hoboken, N. J.** Date, First Survey **22nd May** Last Survey **23rd July 1947**
Reg. Book. (Number of Visits **15**)

82245 on the **S.S. "GRAVENCHON" ex "Sedan"** Tons { Gross **10296**
Net **6154**

Built at **Chester, Pa.** By whom built **Sun S.B. & Dry Dock** Yard No. **-** When built **1945**

Owners **Gouvernement de la Republique Francaise** Port belonging to **Le Havre**

Electric Light Installation fitted by **Sun S.B. & Dry Dock Co.** Contract No. **-** When fitted **1945**

Is the Vessel fitted for carrying Petroleum in bulk **Yes**

System of Distribution **Alternating Current 3 Phase 3 Wire**

Pressure of supply for Lighting **115** volts, **cooking 230** volts, **Heating 230** volts, Power **450** volts.

Direct or Alternating Current, Lighting **Alternating** Power **Alternating**

If alternating current system, state frequency of periods per second **60 Cycles / Second**

Has the Automatic Governor been tested and found efficient when the whole load is suddenly thrown on or off **Yes**

Generators, do they comply with the requirements regarding temperature rise **A.I.E.E. Standards**, are they compound wound **55Kw. Exciters only**
are they over compounded 5 per cent **-**, if not compound wound state distance between each generator **8 feet**

Where more than one generator is fitted are they arranged to run in parallel **Yes 400 Kws S ets**, is an adjustable regulating resistance fitted in series with each shunt field **of exciters Yes**

Have certificates of test results for machines under 100 kw. been submitted and approved **-** Have machines over 100 kw. been inspected by the Surveyors during manufacture and testing **By A.B.S.**

Are all terminals accessible, clearly marked, and furnished with sockets **Yes**, are they so spaced or shielded that they cannot be accidentally earthed, short circuited, or touched **Yes** Are the lubricating arrangements of the generators as per Rule **Yes**

Position of Generators **In Engine Room Starboard Side**, is the ventilation in way of the generators satisfactory **Yes** are they clear of all inflammable material **Yes** if situated near unprotected

woodwork or other combustible material, state distance of same horizontally from or vertically above the generators **-** and **-**, are the generators protected from mechanical injury and damage from water, steam or oil **Yes**, are their axes of rotation fore and aft **Yes**

Earthing, are the bedplates and frames of the generating plant efficiently earthed **Yes**, are the prime movers and their respective generators in metallic contact **Yes** Main Switch Boards, where placed **In Engine Room**

If the generators and main switchboard are not placed in the same compartment, is each generator provided with a fuse on each insulated pole as near as possible to the terminals of the generator, additional to that provided on the main switchboard **-**

Switchboards, are they placed in accessible positions, free from inflammable gases and acid fumes **Yes**, are they protected from mechanical injury and damage from water, steam or oil **Yes** if situated near unprotected woodwork or other combustible material, state distance of same

horizontally from or vertically above the switchboards **-** and **-**, are they constructed wholly of durable, non-ignitable non-absorbent materials **Yes**, is all insulation of high dielectric strength and of permanently high insulation resistance **Yes**

is it of an approved type **Yes**, if semi-insulating material is used, are all conducting parts insulated from the slab with mica or micanite or other non-hygroscopic insulating material, and the slab similarly insulated from its framework **-**, is the non-hygroscopic insulating material of an approved

type **Yes**, and is the frame effectively earthed **Yes** Are the fittings as per Rule regarding:— spacing or shielding of live parts **A.I.E.E. Standards** **A.I.E.E. STANDARDS**

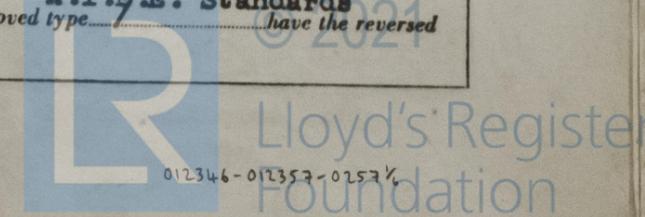
accessibility of all parts **A.I.E.E. Standards**, absence of fuses on back of board **Yes**, temperature rise of omnibus bars **A.I.E.E. Standards**, individual fuses to voltmeter, pilot or earth lamp **Yes**, are moving parts of switches alive in the "off" position **No** are all screws and nuts securing connections effectively locked **Yes** are any fuses fitted on the live side of

switches **No** Main Switchgear, description of switchgear for each generator and each outgoing circuit, and arrangement of equalizer switches **400 Kws generators: Three pole linked circuit breakers with overloads and reverse power trips and three pole isolating switches, 55Kws exciters: D.P. linked breaker with overloads and selector switch, 75 Kw exciters D.P. D.T. switch. Outgoing circuits, two and three pole linked circuit breakers.**

Are turbine driven generators fitted with emergency trip switch as per rule **-** Are cabinets or compartments containing switchboards composed of fire-resisting material or lined with approved material **Yes** Instruments **400 Kws sets 7** **2300 volt panel 10** ammeters **4** **3** volt-

meters **1** synchronizing device for paralleling purposes. For compound machines is the ammeter connected on the opposite pole to equalizer connection **-** Earth Testing, state what means are provided at the main switchboard for indicating the state of the insulation of the system

Earth Lamps **A.I.E.E. Standards** **Switches, Circuit Breakers and Fusible Cut-outs, A.I.E.E. Standards** do these comply with the requirements of the Rules **A.I.E.E. Standards** are the fusible cutouts of an approved type **7** **A.I.E.E. Standards** have the reversed



All Conductors are of annealed copper conforming to British Standard Specification No. 7 (or International Electro-technical Commission Publication No. 28).

The Insulated Conductors are guaranteed to withstand the immersion and resistance tests specified in the Rules.

The foregoing is a correct description.

Electrical Engineers.

Date

COMPASSES.

Distance between electric generators or motors and standard compass 26 feet

Distance between electric generators or motors and steering compass 20 feet

The nearest cables to the compasses are as follows:—

A cable carrying .25 Ampères .75 feet from standard compass .75 feet from steering compass.

A cable carrying 1 Ampères 6 feet from standard compass 4 feet from steering compass.

A cable carrying 10 Ampères 6 feet from standard compass 6 feet from steering compass.

Have the compasses been adjusted with and without the electric installation at work at full power Yes

Has the effect of switching on and off circuits, motors and other electro-magnetic apparatus within the vicinity of the compasses been noted Yes

The maximum deviation due to electric currents was found to be Nil degrees on Any course in the case of the standard compass, and Nil degrees on Any course in the case of the steering compass.

Builder's Signature.

Date

Is this installation a duplicate of a previous case If so, state name of vessel

General Remarks (State quality of workmanship, opinions as to class, &c.)

Classing

The electrical installation to the Requirements of the American Bureau of Shipping has been in operation since, 1945. The vessel is propelled by electric machinery consisting of a turbine driven totally enclosed alternator (with surface air cooler), 4925/5400 KWS, 2300/2370 volts, 1237/1315 amps, 100% P.F., 3 phase, 60/62 cycles, 3600/3715 R, P.M., 110 volts excitation, armature temperature rise by imbedded detector 60°C, field temperature rise by resistance 85°C, and a motor (forced ventilated) 6000 H.P., 2300 volts, 116 amps, 100% P.F., 3 phase, 60 cycles, 90 R.P.M., 120 volts excitation, armature temperature rise by imbedded detector 80°C, field temperature rise by resistance 60°C, both connected by necessary control switch gear. The motor operates as an induction motor during starting and reversing periods, and during such operations, the motor field winding is closed through the motor field discharge resistor. The operation of the control gear equipment is from the engine room. For the protection of the equipment, the following items are fitted.

a) Motor or generator field temperature indicator with selector switch. No aural alarm has been fitted to indicate when the temperature exceeds that allowable, but no exception has

Total Capacity of Generators 6535 Kilowatts.

PTO

The amount of Fee ... \$600.00
Plans \$12.84
Traveling Expenses (if any) \$10.00

When applied for, Sept 1947
When received, 19

Surveyors E. G. Donald

Committee's Minute

NEW YORK OCT 1 1947

Assigned Elec light

Noted 28.11.47



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PARTICULARS OF GENERATING PLANT.

DESCRIPTION OF GENERATOR.	No. of	RATED AT				DRIVEN BY	WHERE DRIVEN BY AN INTERNAL COMBUSTION ENGINE.	
		Kilowatts.	Volts.	Amperes.	Revs. per Min.		Fuel Used.	Flash Point of Fuel.
MAIN exciters	2	400	450	642	1200	Steam Turbine	-	-
exciters	2	75	110	682	1200	Steam Turbine	-	-
Emergency	2	55	120	458	1200	" "	-	-
Emergency	1	75	450	120.5	720	Diesel Engine	Diesel oil	above 150° F.
ROTARY TRANSFORMER								

GENERATOR, LIGHTING AND HEATING CONDUCTORS.

DESCRIPTION.	CONDUCTORS.		COMPOSITION OF STRAND.		TOTAL MAXIMUM CURRENT AMPLIFIED.			Approximate Length (Lead and Return) Feet.	Insulated with	HOW PROTECTED
	No. per Pole.	Total Nominal Area per Pole Sq. Ins.	No.	Diameter.	Circuit.	A.I.E.E.	A.I.E.E.			
MAIN GENERATORS	1	.7854	61	.128	642	864	770	-	V.C.	L.C. & Basket Weave Armoured
75 Kws exciters	1	.7854	61	.128	682	864	"	-	"	" " " "
55 Kws exciters	1	.5890	61	.110	458	705	632	-	"	" " " "
5000 Kws Propulsion	2	2.3562	91	.128	1315	2272	2190	-	"	Bronze Tape
6600 H.P. Propulsion	2	2.3562	91	.128	1160	2272	"	-	"	" "
2300/450 volts TRANSFORMER	1	.1318	19	.094	151	185 ^x	215	-	"	" "
ENGINE ROOM	L6	.0521	7	.097	70	99 ^x	117	-	"	L.C. & Basket WEAVE ARMOURED
BOILER ROOM	L7	.0206	7	.061	35	55.5 ^x	68	-	"	" " " "
EMERGENCY SWITCHBOARDS	1	.1045	19	.083	150	158 ^x	193	-	"	" " " "
400/230 volts P.33	1	.0521	7	.097	58	99 ^x	117	-	"	" " " "
400/80 volts	1	.5100	61	.103	600	466 ^x	530	-	"	" " " "
Shore Conn. Box P.52	1	.0521	7	.097	70	99 ^x	117	-	"	" " " "
Midship & Fore Ltg L3	1	.0261	7	.068	50	65 ^x	78	-	"	" " " "
Bt. Dk. Qrts. Ltg L4	1	.0521	7	.097	70	99 ^x	117	-	"	" " " "
Uppr Dk. Qrts. Ltg L5	1	.0521	7	.097	70	99 ^x	117	-	"	" " " "
Emergency Generator	1	.1045	19	.083	120.5	158 ^x	193	-	"	" " " "
Battery charger D0	1	.0032	7	.024	15	11.5 ^x	"	-	R.I.	" " " "
450/120 volts Ltg Transformers	1	.0521	7	.097	70	99 ^x	117	-	V.C.	" " " "
Navigation Ltg. L.E.I.	1	.0082	7	.038	25	30 ^x	37	-	V.C.	" " " "
WIRELESS	1	.0261	7	.068	50	65 ^x	78	-	"	" " " "
SEARCHLIGHT 1000 W	1	.0051	7	.030	10	16.5 ^x	20	-	R. I.	" " " "
MASTHEAD LIGHT	1	.0032	7	.024	.45	11.5 ^x	"	-	R.I.	" " " "
SIDE LIGHTS	1	.0032	7	.024	.45	11.5 ^x	"	-	R.I.	" " " "
110 Volts Shore Conn.	1	.5100	61	.103	400	466 ^x	530	-	V.C.	" " " "
POOP LIGHTS										
Gyro Compass	1	.0082	7	.038	15	30 ^x	37	-	V.C.	" " " "
Galley Ranges	1	.0414	7	.086	55	88 ^x	107	-	"	" " " "
Bake Oven	1	.013	7	.048	24	41 ^x	51	-	"	" " " "
HEATERS										

MOTOR CONDUCTORS.

DESCRIPTION.	No. of Motors.	CONDUCTORS.		COMPOSITION OF STRAND.		TOTAL MAXIMUM CURRENT AMPLIFIED.			Approximate Length (Lead and Return) Feet.	Insulated with	HOW PROTECTED
		No. per Pole.	Total Nominal Area per Pole Sq. Ins.	No.	Diameter.	In Circuit.	A.I.E.E.	A.I.E.E.			
2- BALLAST PUMP P43 - 44 (each)	1	1	.008	7	.038	14.5	30 ^x	37	-	V.C.	" " " "
MAIN BILGE LINE PUMPS											
GENERAL SERVICE PUMP											
EMERGENCY BILGE PUMP											
SANITARY PUMP P42	1	1	.0051	7	.030	11	22 ^x	20	-	"	" " " "
CIRC. SEA WATER PUMPS P6	1	1	.2356	37	.090	150	279 ^x	347	-	"	" " " "
CIRC. FRESH WATER PUMPS											
AIR COMPRESSOR P40	1	1	.0051	7	.030	6.9	22 ^x	20	-	"	" " " "
2- FRESH WATER PUMP (each) P31 & 32	1	1	.0051	7	.030	3	22 ^x	20	-	"	" " " "
ENGINE TURNING GEAR P48	1	1	.0051	7	.030	4.5	22 ^x	20	-	"	" " " "
ENGINE REVERSING GEAR P20 & 21											
2- LUBRICATING OIL PUMPS (ea) P16 & 17 (ea)	1	1	.0051	7	.030	7.5	22 ^x	20	-	"	" " " "
2- OIL FUEL TRANSFER PUMPS P18 & 19 (ea)	1	1	.013	7	.048	11	41 ^x	51	-	"	" " " "
2- SERVICE PUMPS	1	1	.0051	7	.030	11	22 ^x	20	-	"	" " " "
WINCHES, FORWARD											
WINCHES, AFT											
STEERING GEAR—											
(a) MOTOR GENERATOR P9 & 10											
2- (b) MAIN MOTORS (ea)	1	1	.0206	7	.061	46	55.5 ^x	68	-	"	" " " "
WORKSHOP MOTORS P11											
2- Ventilating Fans P34 & 35	1	1	.0051	7	.030	3	22 ^x	20	-	"	" " " "
2- ventilation P27 & 28 (ea) P26 & 29	1	1	.0051	7	.030	2.5	22 ^x	20	-	"	" " " "
2- Evap. feed pump P23 P24 & P25 (ea)	1	1	.0051	7	.030	1.6	22 ^x	20	-	"	" " " "
3- Forced Draught Fans	1	1	.0829	19	.074	64	134 ^x	168	-	"	" " " "
Lub. Oil Separator	1	1	.0051	7	.030	3	22 ^x	20	-	"	" " " "
Aux. Condensate Pump P15	1	1	.013	7	.048	20	41 ^x	51	-	"	" " " "

American Institute of Electrical Engineers current rating for two and three conductor cables, table No. 9.

current protection devices been tested under working conditions **Yes** Joint Boxes, Section and Distribution Boards, is the construction, protection, insulation, material, and position of these as per rule **A. I. E. E. Standards**

Cables: Single, twin, concentric, or multicore **Yes** are the cables insulated and protected as per Tables IV, V, X or XI of the Rules / **A. I. E. E. standards**

If the cables are insulated otherwise than as per Rule, are they of an approved type **Yes** Fall of Pressure, state maximum between bus bars and any point of the installation under maximum load **-** Cable Sockets, are the ends of all cables having a sectional area of 0.04 square inch and above provided with ~~locking~~ sockets **Yes** Paper Insulated and Varnished Cambric Insulated Cables.

If conductors are paper or varnished cambric insulated, is the dielectric at the exposed ends of the conductor protected from moisture by being suitably sealed with insulating compound **-** or waterproof insulating tape **Yes** Cable Runs, are the cables fixed as far as possible in accessible positions not exposed to drip or accumulation of water or oil, or to high temperature from boilers, steam pipes, uptakes or other hot objects, or to avoidable risk of mechanical damage **Yes** Are cables in machinery spaces, galleys, laundries, bathrooms and lavatories lead covered or run in conduit **Lead covered**

Support and Protection of Cables, state how the cables are supported and protected **Main feeder cables lead covered and basket weave armoured run in conduit on deck supported by straps under fore and aft walk way.**

Cables in accommodation and engine room clipped to brackets and bulkheads. **Main propulsion cables supported on cleats.**

If cables are run in wood casings, are the casings and caps secured by screws **-** are the cap screws of brass **-** are the cables run in separate grooves **-** If armoured and lead covered cables are secured by metal clips, are the clips spaced as per Table VIII **A. I. E. E. Standards**

Refrigerated Chambers, are the cables and fittings in accordance with the special requirements **Yes**

Joints in Cables, state if any, and how made, insulated, and protected **In junction boxes**

Watertight Glands and Deck Tubes, are all cables passing through decks and watertight bulkheads provided with deck tubes or watertight glands **Yes** Bushes in Beams and Non-watertight Partitions, where unarmoured cables pass through beams and non-watertight partitions, are the holes efficiently bushed **Yes** state the material of which the bushes are made **Lead bushes and steel collars**

Earthing Connections, state what earthing connections are fitted and their respective sectional areas **cables effectively earthed**

are their connections made as per Rule **Yes**

Alternative Lighting, are the groups of lights in the propelling machinery space arranged as per Rule **Yes** Emergency Supply, state position and method of control of the emergency supply and how the generator is driven **Diesel driven emergency generator**

In engine room, poop deck level, which can be connected to main aux. bus bars through **contractors interlocked with two 400 Kws. aux. generator sets so that it cannot be closed until the breakers of these sets have been tripped.**

Navigation Lamps, are these separately wired **Yes** controlled by separate switch and separate fuses **Yes** are the fuses double pole **Yes**

are the switches and fuses grouped in a position accessible only to the officers on watch **wheelhouse**

has each navigation lamp an automatic indicator as per Rule **Yes** Secondary Batteries, are they constructed and fitted as per Rule **-**

Fittings, are all fittings on weather decks, in stokeholds and engine rooms and wherever exposed to drip or condensed moisture, watertight **Yes**

are any fittings placed in spaces in which goods are liable to be stacked in close proximity to them; if so, how are they protected **-**

are any fittings placed in spaces where inflammable or explosive dust or gases are liable to be present, if so, how are they protected **Bulkhead**

fittings in pump rooms **Outside the compartments**

where are the controlling switches situated **Outside the compartments**

are all fittings suitably ventilated **Yes** are all switches and lampholders constructed wholly of non-ignitable, non-absorbent materials **Yes**

A. I. E. E. Standards

Heating and Cooking Appliances, are they constructed and fitted as per Rule / are air heaters constructed and fitted as per Rule **-**

Searchlight Lamps, No. of **1** whether fixed or portable **Yes** are their fittings as per Rule **Yes**

Are Lamps, other than searchlight lamps, No. of **-** are their live parts insulated from the frame or case **-** are their fittings as per Rule **-**

Motors, are their working parts readily accessible **Yes** are the coils self-contained and readily removable for replacement **Yes**

A. I. E. E. Standards

are the brushes, brush holders, terminals and lubricating arrangements as per Rule / are the motors placed in well-ventilated compartments in which inflammable gases cannot accumulate and clear of all inflammable material **Yes** are they protected from mechanical injury and damage from water, steam or oil **Yes** are their axes of rotation fore and aft **possible** if situated near unprotected woodwork or other combustible material, are the motors of the totally enclosed, pipe ventilated, forced draught, drip or flame proof type **Drip proof and totally enclosed**

if not of this type, state distance of the combustible material horizontally or vertically above the motors **-** and **-**

have machines of over 100 BPH been inspected by the Surveyors during manufacture and testing **A. I. E. E. Standards** Control Gear and Resistances, are the generator field and motor speed regulators, starters and controllers constructed and fitted as per Rule / Lightning Conductors, where lightning conductors are required, are these fitted as per Rule **Yes** Ships carrying Oil having a Flash Point less than 150°F. Have the special requirements of the Rules been complied with regarding switches, joint boxes, section and distribution boards, protection of cables, method of distribution, lead of cables, lights and fittings **Yes** are all fuses of the filled cartridge type **Yes** are they of an approved type / **A. I. E. E. Standards**

If portable lamps for use in dangerous spaces are supplied, are they of a self-contained, battery-fed type approved by the Home Office **-**

Spare Gear, if the vessel is for open sea service have spares been supplied as per Rule **Yes (outstanding spare gear to be delivered to the ship)**

Classing continued:-
been taken in this instance.

- b) Motor or generator stator temperature indicator with selector switches.
- c) Phase balance relay to protect against unbalancing or single phase operation. This relay operates when the current unbalance reaches 25%.
- d) Ground detecting relay provides protection in event of faults between any one of the 3 phases to ground. The relay is connected to a current transformer whose primary is in series with the connection by means of which the generator neutral is grounded. This relay can be set to trip at ampere values of .5 to 2.5 amps. When a phase becomes grounded, current flows into the grounded neutral and energizes the ground relay which operates and closes its contacts thus removing the excitation. A resistor limits ground current to 20 amperes. No aural device is fitted, but no exception has been take in this instance.

The plans attached have been examined and found to be in accordance with A.I.E.E. Standards and generally in accordance with the Rules except as noted hereafter.

- 1) No overload or short circuit protection is provided on main propulsion units.
- 2) No overload ^{or} short circuit protection is provided on the 75 KWS. exciter generators used for main propulsion excitation.
- 3) Main propulsion cable have no lead alloy sheath as required by the Rules.

The dimensions in this report have been taken from the attached plans. These dimensions have been checked as far as possible on the ship and found correct.

The materials and workmanship are good and the installation has been examined under working conditions and found to be satisfactory.

In our opinion, the electrical installation is such as could be accepted by the Committee for classification.

H. G. Donald.



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DESCRIPTION	No. of Motors	CONDUCTORS		COMPOSITION OF STRAND		TOTAL MAX. CURRENT AMPS		APP. LENGTH LEAD & RETURN	INSUL. WITH	HOW PROTECTED
		No. PER POLE	TOTAL NOMINAL AREA PER POLE	No	DIAMETER	CIRCUIT	A. I. E. E. RULE			
2- Stripping Pumps (each)	1	1	.0521	7	.097	61	99 ^x ₁₁₇	-	V.C.	L.C. & Basket Weave Armoured
3- Cargo Pumps (each)	1	1	.3535	37	.110	243	367 ^x ₄₁₀	-	"	" " " " "
Aux. Circ. Pump P14	1	1	.0261	7	.068	40	65 ^x ₇₅	-	"	" " " " "
P12 & P13 (each)	1	1	.0206	7	.061	31	55.5 ^x ₆₈	-	"	" " " " "
2- Main condensate Pumps Fwd & Aft (each)	1	1	.0521	7	.097	60.5	99 ^x ₁₁₇	-	"	" " " " "
2- Fire Pumps P7 & P8 P36 & 37 (each)	1	1	.0521	7	.097	60.5	99 ^x ₁₁₇	-	"	" " " " "
2- Eng Rm. Vent Fans P. 38	1	1	.0051	7	.030	3	22 ^x ₂₀	-	"	" " " " "
Refrig. Power	-	1	.0082	7	.038	23	30 ^x ₃₇	-	"	" " " " "
2- Refrig Comp RS (ea)	1	1	.0051	7	.030	9.8	22 ^x ₂₀	-	"	" " " " "
Refrig. Circ Pump P39 Atmos	1	1	.0051	7	.030	1	22 ^x ₂₀	-	"	" " " " "
Drain & Rec. Pump P41	1	1	.0051	7	.030	3	22 ^x ₂₀	-	"	" " " " "
Salt water Pump P. 45 Aft	1	1	.0051	7	.030	11	22 ^x ₂₀	-	"	" " " " "
Drinking Water Pump P46	1	1	.0051	7	.030	1.6	22 ^x ₂₀	-	"	" " " " "
Drinking Water "	1	1	.0051	7	.030	1.6	22 ^x ₂₀	-	"	" " " " "
Sounding Machine P47 fan	1	1	.0032	7	.024	1.6	22 ^x ₁₂	-	"	" " " " "
Main motor coil 149	1	1	.013	7	.048	20	41 ^x ₅₁	-	"	" " " " "
Shaft Turning gear P51	1	1	.0051	7	.030	7.5	22 ^x ₂₀	-	"	" " " " "
Combustion control P54	1	1	.013	7	.048	20	41 ^x ₅₁	-	"	" " " " "
Pump Rm. Exh Blower	1	1	.0051	7	.030	2	22 ^x ₂₀	-	"	" " " " "
Lathe	1	1	.0051	7	.030	3	22 ^x ₂₀	-	"	" " " " "
Drill Press	1	1	.0051	7	.030	1.6	22 ^x ₂₀	-	"	" " " " "
Grinder	1	1	.0051	7	.030	4.5	22 ^x ₂₀	-	"	" " " " "

Handwritten signature