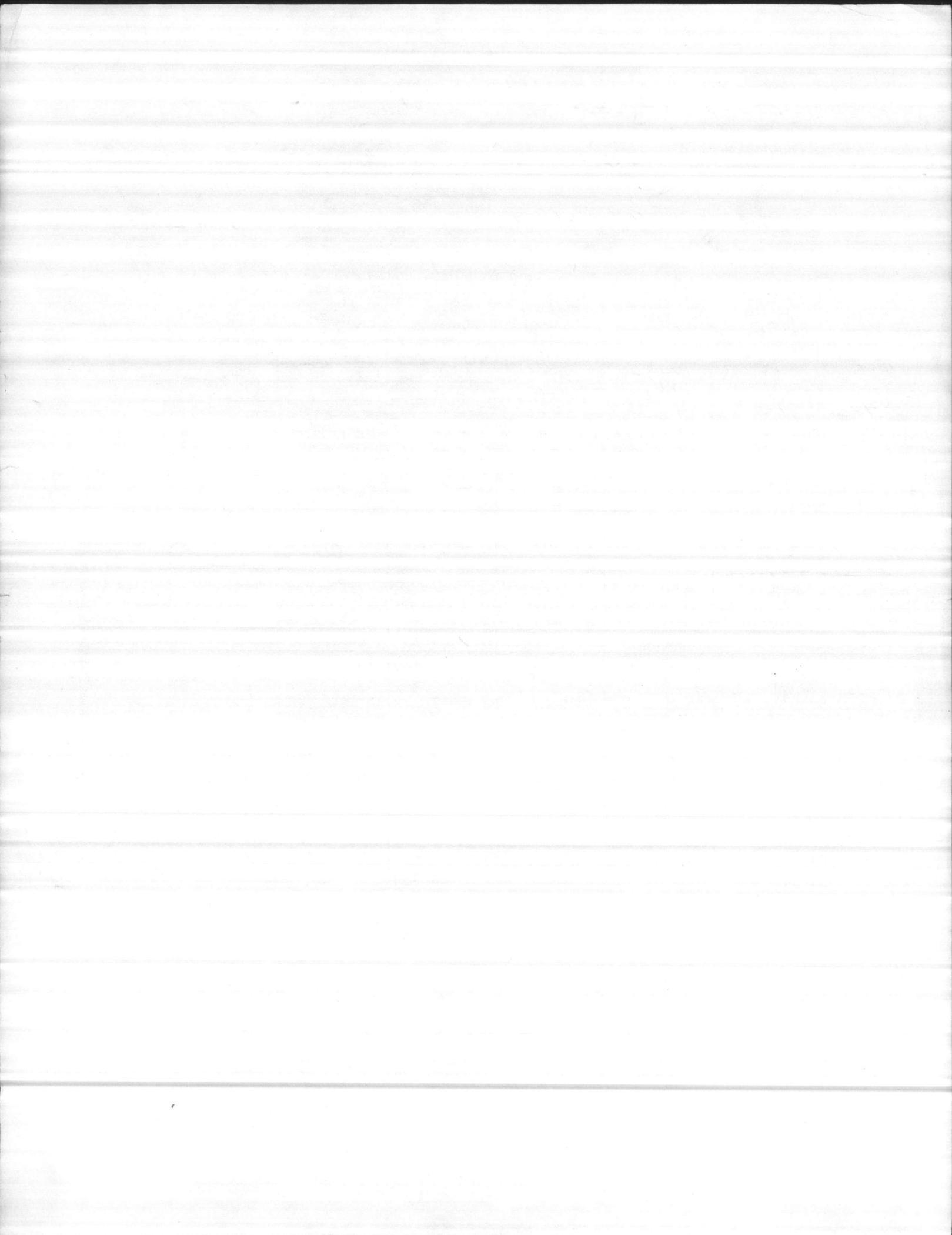


FILE FOLDER

DESCRIPTION ON TAB:

Tarawa Terrace Wells

- Outside/inside of actual folder did not contain hand written information**
- Outside/inside of actual folder did contain hand written information**
***Scanned as next image**



<input checked="" type="checkbox"/> CHECKED BOX APPLIES		<input checked="" type="checkbox"/> ORDER FOR SUPPLIES OR SERVICES		<input type="checkbox"/> REQUEST FOR QUOTATIONS NO. RETURN COPIES OF THIS QUOTE BY (THIS IS NOT AN ORDER. See DD Form 1155r)		PAGE 1 OF 1				
1. CONTRACT/PURCH ORDER NO. M67001-77-M-3608		2. DELIVERY ORDER NO.		3. DATE OF ORDER 77 JAN 05		4. REQUISITION/PURCH REQUEST NO. M93058-6358-W002				
6. ISSUED BY: Purchasing & Contracting Office Bldg 1211, Marine Corps Base Camp Lejeune, N. Carolina 28542		CODE M67001		7. ADMINISTERED BY: (If other than 6) <i>Well TT30</i>		8. DELIVERY FOB <input type="checkbox"/> DESTINATION <input checked="" type="checkbox"/> OTHER (See Schedule if other)				
9. CONTRACTOR/QUOTER NAME AND ADDRESS L JOHNSTON PUMP CO. 2901 HAMILTON BLVD. S. PLAINFIELD, N.J. 07080 2/pb/hs		CODE		FACILITY CODE		10. DELIVER TO FOB POINT BY: 28 FEB 77				
14. SHIP TO: Freight Traffic Branch Bldg 1011, Camp Lejeune, N. Carolina M67001-77-M-3608 28542		CODE		15. PAYMENT WILL BE MADE BY: Base Disbursing Officer MCB, Camp Lejeune, North Carolina 28542		11. CHECK IF SMALL BUSINESS <input type="checkbox"/> MBE				
16. TYPE OF ORDER DELIVERY PURCHASE <input checked="" type="checkbox"/>		This delivery order is subject to instructions contained on this side of form only and is issued on another Government agency or in accordance with and subject to terms and conditions of above numbered contract.								
Reference your telequote 77 JAN 03		furnish the following on terms specified herein, including: for U. S. purchases, General Provisions of Purchase Order on DD Form 1155r (Except CLAUSE NO. 13 APPLIES ONLY IF THIS BOX <input type="checkbox"/> IS CHECKED, and NO. 15 IF THIS BOX <input type="checkbox"/> IS CHECKED); special provisions 10 USC 2304(a)(3) or as specified in the schedule if within the U. S., its possessions or Puerto Rico; if otherwise, under 2304(a)(6).								
<input type="checkbox"/> If checked, Additional General Provisions apply; Supplier shall sign "Acceptance" on DD Form 1155r and return copies.		and delivery as indicated. This purchase is negotiated under authority of								
17. ACCOUNTING AND APPROPRIATION DATA - ACCOUNTING CLASSIFICATION (REV. 7-65) PLUS TRANS										
ITEM NO.	APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUREAU CONT. NO.	SUB-ALLOT.	AUTH'N ACCT'G ACTY	TRANS. TYPE	PROPERTY ACCT'G ACTY	COUNTY	COST CODE	AMOUNT
ALL	1771106.2720	000	67001	0	067001	2D	000000		AA72333042383T	\$3,488.00
18. ITEM NO.	19. PRIORITY 14	20. QUANTITY ORDERED/ACCEPTED*				21. UNIT	22. UNIT PRICE	23. AMOUNT		
0001.	4320-00-C99-4710 Pump Johnson vertical turbine deep well complete (Less electric motor) Size column assy. 4"X1-1/2"X1" Setting 50' stage 4, Bowl assy 7BC, Suction pipe 4"X10' GPM 110 TDH 70' Head size 10X4 Flanged Column.	1	ea	3,488.00	\$3,488.00					
THIS IS A CONFIRMING ORDER...Confirms telephonic order of same number and date given your MR LACKS by our MRS. BRYDON DO NOT DUPLICATE.										
FOB: S. PLAINFIELD, N.J. Trans charges estimated not to exceed \$450.00. All trans charges prepaid and listed on dealers invoice as a separate item.										
Inquiries regarding this order should be made to: Mr. Cole (919-451-2332)										
* If quantity accepted by the Government is same as quantity ordered, indicate by <input checked="" type="checkbox"/> mark. If different, enter actual quantity accepted below quantity ordered and encircle.		24. UNITED STATES OF AMERICA <i>J. C. Crumley</i> J. C. CRUMLEY PURCHASING OFFICER					25. TOTAL \$3,488.00		29. DIFFERENCES	
26. QUANTITY IN COLUMN 20 HAS BEEN: <input type="checkbox"/> RECEIVED <input type="checkbox"/> INSPECTED <input type="checkbox"/> ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED		27. SHIP. NO.		28. D.O. VOUCHER NO.		30. INITIALS		33. AMOUNT VERIFIED CORRECT FOR		
Date (Signature of authorized Government representative)		<input type="checkbox"/> FINAL <input type="checkbox"/> PARTIAL		32. PAID BY 67001-SYM #.5190 MCB CLNC		34. CHECK NUMBER		35. BILL OF LADING NO.		
36. I CERTIFY that this account is correct and proper for payment (Signature and title of Certifying Officer)		<input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL		39. DATE RECEIVED		40. TOTAL CONTAINERS		41. S/R ACCOUNT NUMBER		42. S/R VOUCHER NO.

THIS PARAGRAPH APPLIES ONLY TO QUOTATIONS SUBMITTED:

Supplies are of domestic origin unless otherwise indicated by quoter. The Government reserves the right to consider quotations or modifications thereof received after the date indicated should such action be in the interest of the Government. This is a request for information and quotations furnished are not offers. When quoting, complete blocks 11, 12, 22, 23, 25. If you are unable to quote, please advise. This request does not commit the Government to pay any cost incurred in preparation or the submission of this quotation or to procure or contract for supplies or services.

GENERAL PROVISIONS

1. INSPECTION AND ACCEPTANCE - Inspection and acceptance will be at destination, unless otherwise provided. Until delivery and acceptance, and after any rejections, risk of loss will be on the Contractor unless loss results from negligence of the United States Government. Notwithstanding the requirements for any Government inspection and test contained in specifications applicable to this contract, except where specialized inspections or tests are specified for performance solely by the Government, the Contractor shall perform or have performed the inspections and tests required to substantiate that the supplies and services provided under the contract conform to the drawings, specifications and contract requirements listed herein, including if applicable the technical requirements for the manufacturers' part numbers specified herein.

2. VARIATION IN QUANTITY - No variation in the quantity of any item called for by this contract will be accepted unless such variation has been caused by conditions of loading, shipping, or packing, or allowances in manufacturing processes, and then only to the extent, if any, specified elsewhere in this contract.

3. PAYMENTS - Invoices shall be submitted in quadruplicate (*one copy shall be marked "Original"*) unless otherwise specified, and shall contain the following information: Contract or Order number, Item number, contract description of supplies or services, sizes, quantities, unit prices and extended totals. Bill of lading number and weight of shipment will be shown for shipments on Government Bills of Lading. Unless otherwise specified, payment will be made on partial deliveries accepted by the Government when the amount due on such deliveries so warrants.

4. DISCOUNTS - In connection with any discount offered, time will be computed from date of delivery of the supplies to carrier when acceptance is at the point of origin, or from date of delivery at destination or port of embarkation when delivery and acceptance are at either of these points, or from the date the correct invoice or voucher is received in the office specified by the Government, if the latter is later than date of delivery. Payment is deemed to be made for the purpose of earning the discount on the date of mailing of the Government check.

5. DISPUTES - (a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall mail or otherwise furnish a copy thereof to the Contractor. This decision shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the Secretary. The decision of the Secretary or his duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. The Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision. (b) This "Disputes" clause does not preclude consideration of law questions in connection with decisions provided for in (a) above, provided, that nothing in this contract shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

6. FOREIGN SUPPLIES - This contract is subject to the Buy American Act (41 U.S.C. 10a-d) as implemented by Executive Order 10582 of December 17, 1954, and any restrictions in appropriation acts on the procurement of foreign supplies.

7. CONVICT LABOR - The Contractor agrees not to employ for work under this contract any person undergoing sentence of imprisonment at hard labor.

8. OFFICIALS NOT TO BENEFIT - No member of or Delegate to Congress or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

9. COVENANT AGAINST CONTINGENT FEES - The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration or otherwise recover, the full amount of such commission, percentage, brokerage or contingent fee.

10. GRATUITIES - (a) The Government may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found after notice and hearing, by the Secretary or his duly authorized representative, that gratuities (*in the form of entertainment, gifts or otherwise*) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the Government with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract, provided, that the existence of the facts upon which the Secretary or his duly authorized representative makes such findings shall be in issue and may be reviewed in any competent court. (b) In the event this contract is terminated as provided in paragraph (a) hereof the Government shall be entitled (i) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor and (ii) as a penalty in addition to any other damages to which it may be entitled by law to exemplary damages in an amount (*as determined by the Secretary or his duly authorized representative*) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee. (c) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

11. RENEGOTIATION - This contract, and any subcontract hereunder, is subject to the Renegotiation Act of 1951, as amended (50 U.S.C. App. 1211 et seq.) and shall be deemed to contain all the provisions required by Section 104 thereof, and is subject to any subsequent act of Congress providing for the renegotiation of contracts.

12. CONDITION FOR ASSIGNMENT - This Purchase Order may not be assigned pursuant to the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), unless or until the supplier has been requested and has accepted this order by executing the Acceptance hereon.

13. COMMERCIAL WARRANTY - The Contractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the Contractor gives to any customer for such supplies or services and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to the Government by any other clause of this contract.

14. PRIORITIES, ALLOCATIONS AND ALLOTMENTS DEFENSE MATERIALS SYSTEM - When the amount of the order is \$500 or more the Contractor shall follow the provisions of DMS Reg. 1 and all other applicable regulations and orders of the Business and Defense Services Administration in obtaining controlled materials and other products and materials needed to fill this order.

15. FAST PAYMENT PROCEDURE -

(a) *General*. This is a fast payment order. Invoices will be paid on the basis of the Contractor's delivery to a post office, common carrier, or, in shipment by other means, to the point of first receipt by the Government.

(b) *Responsibility for Supplies*. Title to the supplies shall vest in the Government upon delivery to a post office or common carrier for shipment to the specified destination. If shipment is by means other than post office or common carrier, title to the supplies shall vest in the Government upon delivery to the point of first receipt by the Government. Notwithstanding any other provision of the purchase order, the Contractor shall assume all responsibility and risk of loss for supplies (i) not received at destination, (ii) damaged in transit, or (iii) not conforming to purchase requirements. The Contractor shall either replace, repair, or correct such supplies promptly at his expense, provided instructions to do so are furnished by the Contracting Officer within ninety (90) days from the date title to the supplies vests in the Government.

(c) *Preparation of Invoice*.

(1) Upon delivery of supplies to a post office, common carrier, or in shipments by other means, the point of first receipt by the Government, the Contractor shall prepare an invoice in accordance with Clause 3 of the General Provisions of Purchase Order, except that invoices under a blanket purchase agreement shall be prepared in accordance with the provisions of the agreement. In shipments by either post office or common carrier, the Contractor shall either (A) cite on his invoice the date of shipment, name and address of carrier, bill of lading number or other shipment document number, or (B) attach copies of such documents to his invoice as evidence of shipment. In addition the invoice shall be prominently marked "Fast Pay." In case of delivery by other than post office or common carrier, a receipted copy of the Contractor's delivery document shall be attached to the invoice as evidence of delivery.

(2) If the purchase price excludes the cost of transportation, the Contractor shall enter the prepaid shipping cost on the invoice as a separate item. The cost of parcel post insurance will not be paid by the Government. If transportation charges are separately stated on the invoice, the Contractor agrees to retain related paid freight bills or other transportation billings paid separately for a period of three years and to furnish such bills to the Government when requested for audit purposes.

(d) *Certification of Invoice*. The Contractor agrees that the submission of an invoice to the Government for payment is a certification that the supplies for which the Government is being billed have been shipped or delivered in accordance with shipping instructions issued by the ordering officer, in the quantities shown on the invoice, and that such supplies are in the quantity and of the quality designated by the cited purchase order.

OUTER SHIPPING CONTAINERS SHALL BE MARKED "FAST PAY"

16. (*This clause applies if this contract is for services and is not exempted by applicable regulations of the Department of Labor.*)

SERVICE CONTRACT ACT OF 1965 - Except to the extent that an exemption, variation, or tolerance would apply pursuant to 29 CFR 4.6 if this were a contract in excess of \$2,500, the Contractor and any subcontractor hereunder shall pay all of his employees engaged in performing work on the contract not less than the minimum wage specified under section 6(a)(1) of the Fair Labor Standards Act of 1938, as amended (\$1.60 per hour). However, in cases where section 6(e)(2) of the Fair Labor Standards Act of 1938 is applicable, the rates specified therein will apply. All regulations and interpretations of the Service Contract Act of 1965 expressed in 29 CFR Part 4 are hereby incorporated by reference in this contract.

ADDITIONAL GENERAL PROVISIONS

17. CHANGES - The Contracting Officer may at any time, by a written order, and without notice to the sureties, make changes, within the general scope of this contract, in (i) drawings, designs, or specifications, where the supplies to be furnished are to be specially manufactured for the Government in accordance therewith; (ii) method of shipment or packing; and (iii) place of delivery. If any such change causes an increase or decrease in the cost of, or the time required for performance of this contract, whether changed or not changed by any such order, an equitable adjustment shall be made by written modification of this contract. Any claim by the Contractor for adjustment under this clause must be asserted within 30 days from the date of receipt by the Contractor of the notification of change provided that the Contracting Officer, if he decides that the facts justify such action, may receive and act upon any such claim if asserted prior to final payment, under this contract. Failure to agree to any adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes." However, nothing in this clause shall excuse the Contractor from proceeding with the contract as changed.

18. TERMINATION FOR DEFAULT - The Contracting Officer, by written notice, may terminate this contract, in whole or in part, for failure of the Contractor to perform any of the provisions hereof. In such event, the Contractor shall be liable for damages, including the excess cost of procuring similar supplies or services; provided that, if (i) it is determined for any reason that the Contractor was not in default or (ii) the Contractor's failure to perform is without his and his subcontractor's control, fault or negligence, the termination shall be deemed to be a termination for convenience under paragraph 15. As used in this provision the term "subcontractor" and "subcontractors" means subcontractors at any tier.

19. TERMINATION FOR CONVENIENCE - The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the best interest of the Government. If this contract is for supplies and is so terminated, the Contractor shall be compensated in accordance with Section VIII of the Armed Services Procurement Regulation, in effect on this contract's date. To the extent that this contract is for services and is so terminated, the Government shall be liable only for payment in accordance with the payment provisions of this contract for services rendered prior to the effective date of termination.

20. ASSIGNMENT OF CLAIMS - Claims for monies due or to become due under this contract shall be assigned only pursuant to the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15). However, payments to an assignee of monies under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or set-off. (*See Clause 12.*)

ACCEPTANCE

The Contractor hereby accepts the offer represented by this numbered purchase order as it may previously have been or is now modified, subject to all of the terms and conditions set forth, and agrees to perform the same.

NAME OF CONTRACTOR	
SIGNATURE	
TYPED NAME AND TITLE	DATE SIGNED

REMARKS		
---------	--	--

SCORE!

USE

M.J.Grove Lime Company

PRODUCTS

LIME • STONE • FREE STATE MASONRY CEMENT • BUILDING SUPPLIES
GENERAL MERCHANDISE • STREET & ROAD CONSTRUCTION

Wells at Sarana

#8 - 100 G.P.M.

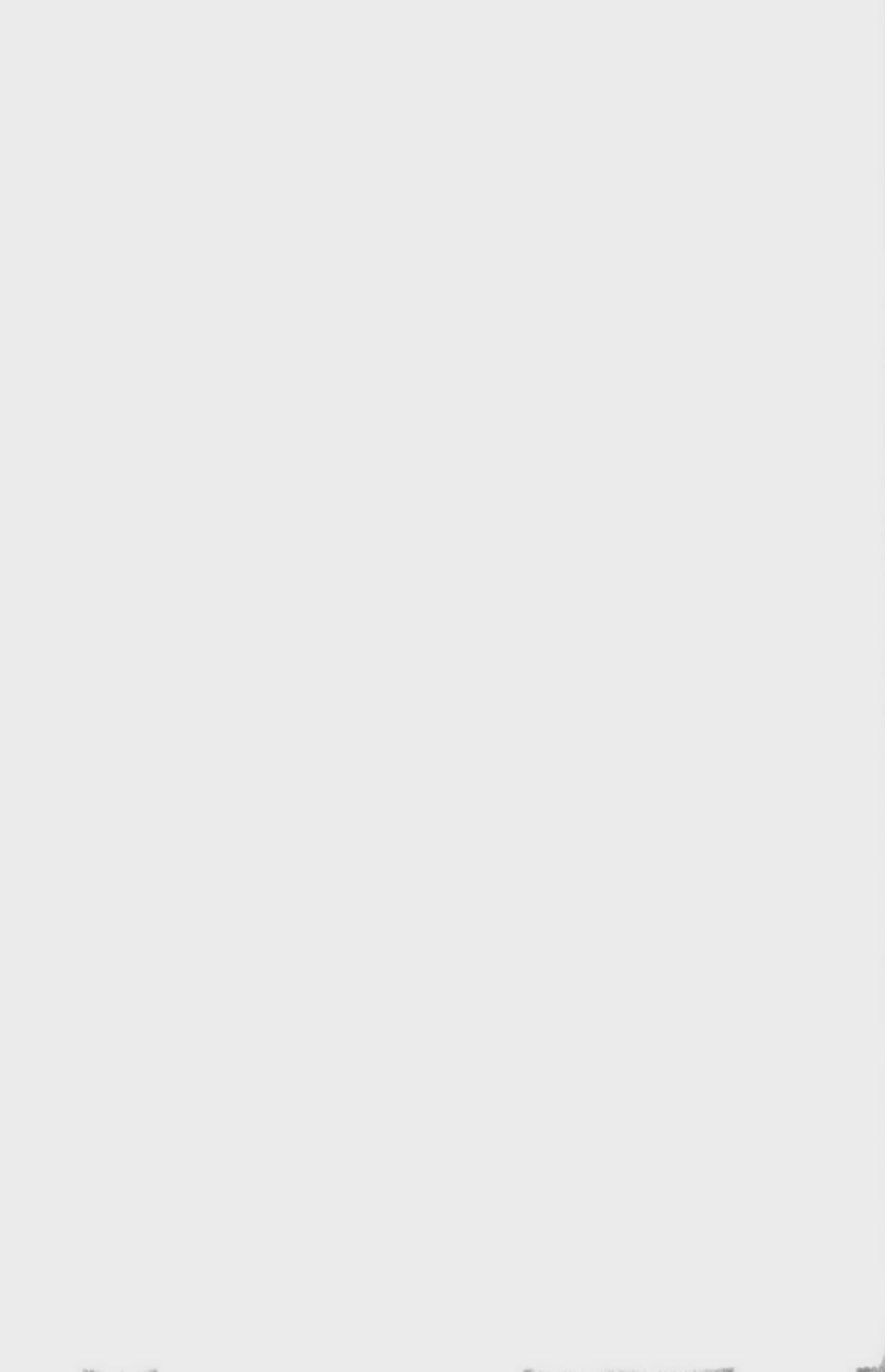
9 - 300 "

10 - 350 "

11 - 200 "

by SAM MORRIS

11-2-61

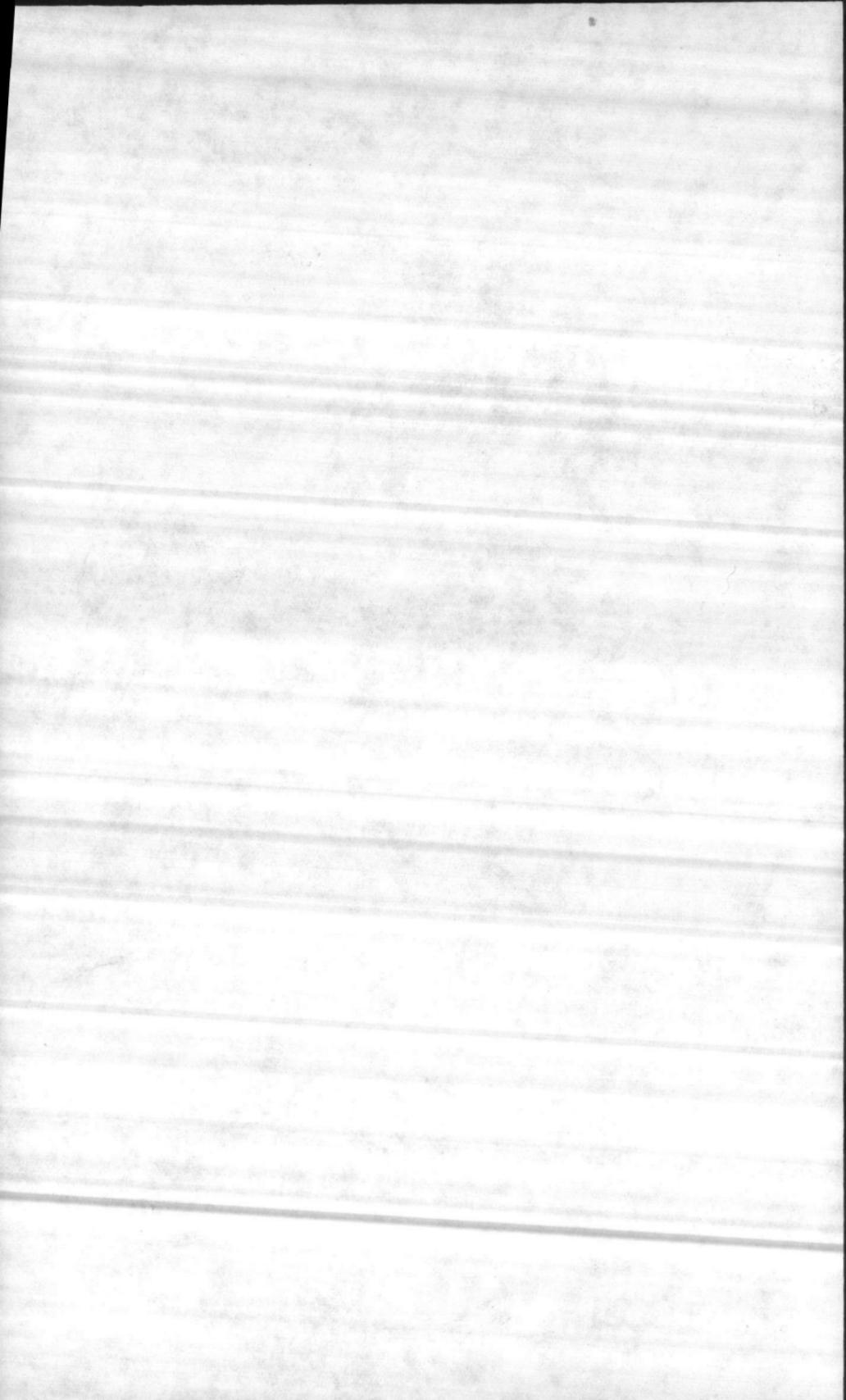


Pl. 38

Serial # 63-3534-1

Size 12-DKH

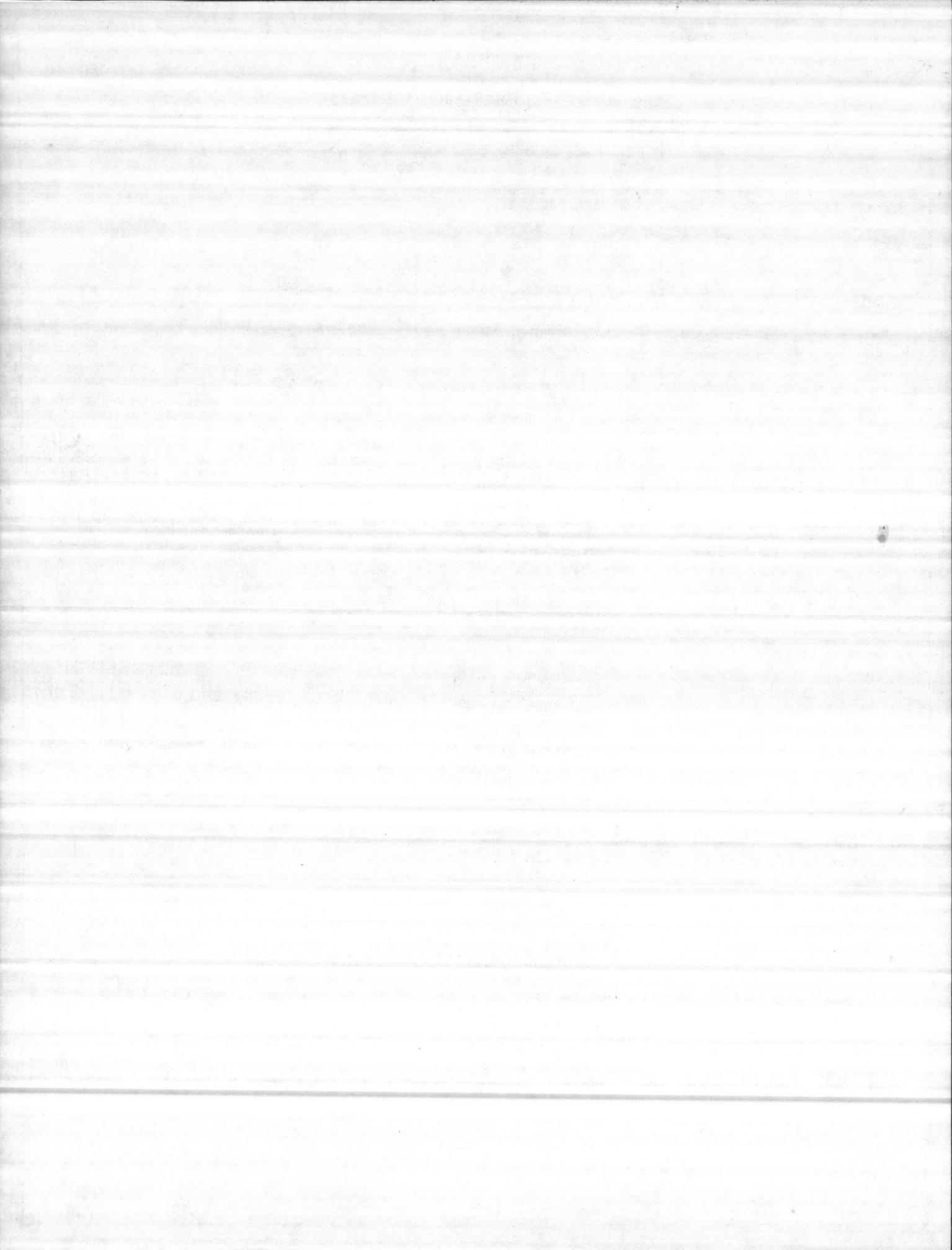
J. B.



U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
OFFICE OF WATER DATA COORDINATION
INVENTORY OF HYDROLOGIC DATA STATIONS
QUALITY OF WATER

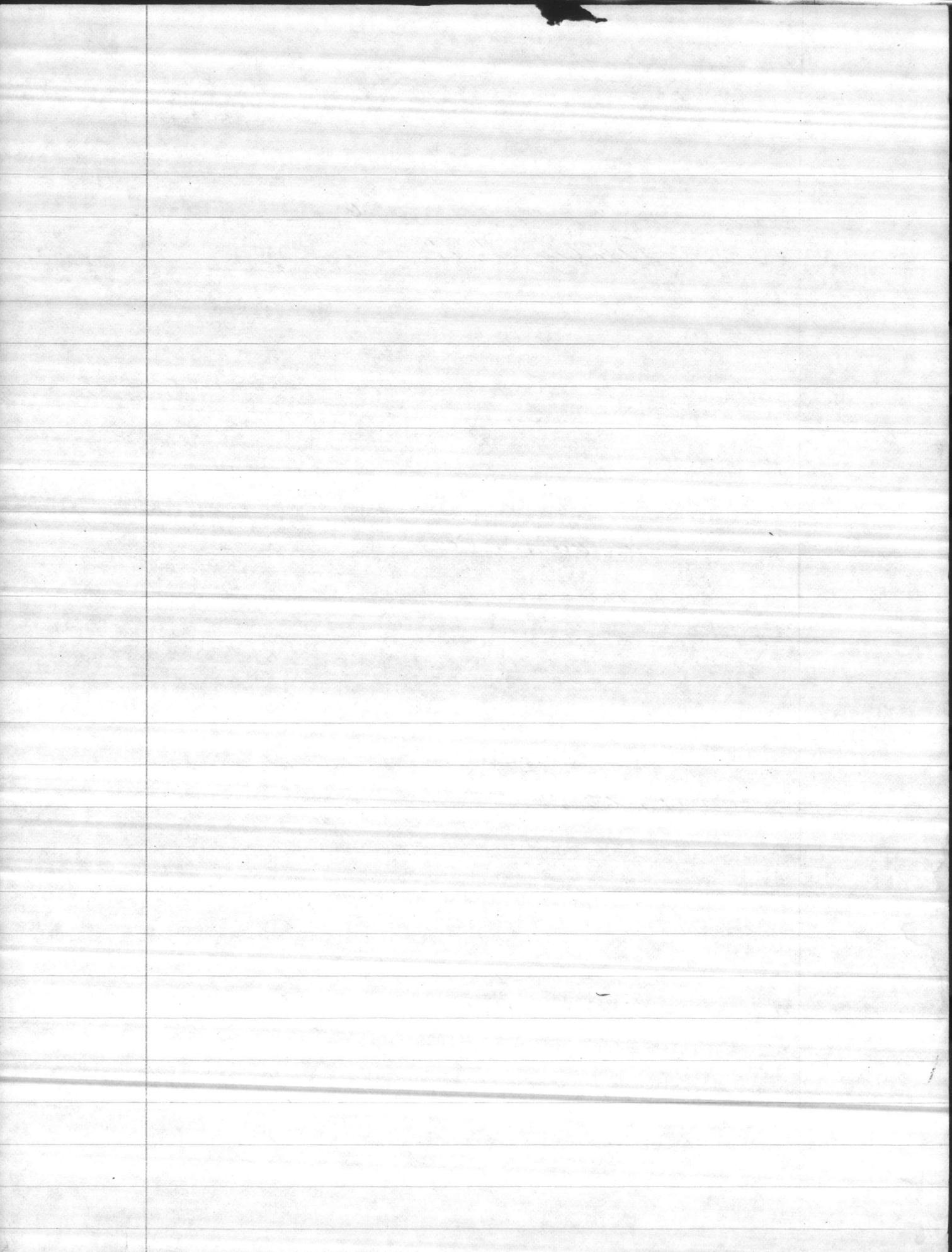
APPROVED.
Budget Bureau No. 42-R1485
Approval Expires June 30, 1976.

1. AGENCY CODE MC	2. TYPE Q	3. LATITUDE 34° 44' 02" N	4. LONGITUDE 77° 22' 10" W			
6. AGENCY STATION NO. 31		7. STATION NAME TT38 31				
8. DRAINAGE BASIN CODE No. Letter 06 N		9. STATE CODE 37	10. COUNTY CODE 133			
		11. COUNTY NAME Onslow				
12. PERIOD OF RECORD Began 1973 Discontinued		13. <input type="checkbox"/> Continuous <input type="checkbox"/> Interruption Exceeds 1 Year				
14.						
15. SITE						
<input type="checkbox"/> 101 Stream <input type="checkbox"/> 104 Reservoir <input checked="" type="checkbox"/> 107 Well <input type="checkbox"/> 102 Canal <input type="checkbox"/> 105 Estuarine zone <input type="checkbox"/> 108 Drain <input type="checkbox"/> 103 Lake <input type="checkbox"/> 106 Spring <input type="checkbox"/> 109 Other						
16. TYPES OF DATA AVAILABLE AND FREQUENCY OF MEASUREMENT (Enter appropriate number (1-8) beside each parameter to indicate frequency of measurement. For parameters telemetered, enter "T".)						
1 Continuous 3 Daily 5 Monthly 7 Annual 2 Seasonal 4 Weekly 6 Quarterly 8 Other Periodic						
<table style="width:100%; border:none;"> <tr> <td style="width:33%; vertical-align: top;"> Physical 311— Temperature 312— Specific conductance 313— Turbidity 314— Color 315— Odor 316— <input checked="" type="checkbox"/> pH (field) 317— <input type="checkbox"/> pH (lab) 318— Eh 319— Suspended solids 320— Other </td> <td style="width:33%; vertical-align: top;"> Chemical 331— <input checked="" type="checkbox"/> Dissolved solids 332— <input checked="" type="checkbox"/> Chloride 333— Nutrients (nitrogen) 334— Nutrients (phosphorus) 335— <input checked="" type="checkbox"/> Common ions 336— <input checked="" type="checkbox"/> Hardness 337— Radiochemical 338— Dissolved oxygen 339— Other gases 340— Minor elements 341— Pesticides (insecticides, herbicides, etc.) 342— Detergents - MBS 343— Biochemical oxygen demand 344— Carbon (total, dissolved, etc.) </td> <td style="width:33%; vertical-align: top;"> Biologic 361— Coliforms 362— Other micro-organisms (Benthic organism, phytoplankton, etc.) 363— Other Sediment 371— Concentration (suspended) 372— Particle size (suspended) 373— Particle size (bed load material) 374— Other </td> </tr> </table>				Physical 311— Temperature 312— Specific conductance 313— Turbidity 314— Color 315— Odor 316— <input checked="" type="checkbox"/> pH (field) 317— <input type="checkbox"/> pH (lab) 318— Eh 319— Suspended solids 320— Other	Chemical 331— <input checked="" type="checkbox"/> Dissolved solids 332— <input checked="" type="checkbox"/> Chloride 333— Nutrients (nitrogen) 334— Nutrients (phosphorus) 335— <input checked="" type="checkbox"/> Common ions 336— <input checked="" type="checkbox"/> Hardness 337— Radiochemical 338— Dissolved oxygen 339— Other gases 340— Minor elements 341— Pesticides (insecticides, herbicides, etc.) 342— Detergents - MBS 343— Biochemical oxygen demand 344— Carbon (total, dissolved, etc.)	Biologic 361— Coliforms 362— Other micro-organisms (Benthic organism, phytoplankton, etc.) 363— Other Sediment 371— Concentration (suspended) 372— Particle size (suspended) 373— Particle size (bed load material) 374— Other
Physical 311— Temperature 312— Specific conductance 313— Turbidity 314— Color 315— Odor 316— <input checked="" type="checkbox"/> pH (field) 317— <input type="checkbox"/> pH (lab) 318— Eh 319— Suspended solids 320— Other	Chemical 331— <input checked="" type="checkbox"/> Dissolved solids 332— <input checked="" type="checkbox"/> Chloride 333— Nutrients (nitrogen) 334— Nutrients (phosphorus) 335— <input checked="" type="checkbox"/> Common ions 336— <input checked="" type="checkbox"/> Hardness 337— Radiochemical 338— Dissolved oxygen 339— Other gases 340— Minor elements 341— Pesticides (insecticides, herbicides, etc.) 342— Detergents - MBS 343— Biochemical oxygen demand 344— Carbon (total, dissolved, etc.)	Biologic 361— Coliforms 362— Other micro-organisms (Benthic organism, phytoplankton, etc.) 363— Other Sediment 371— Concentration (suspended) 372— Particle size (suspended) 373— Particle size (bed load material) 374— Other				
17. SUPPLEMENTARY DATA AVAILABLE FOR STATION						
<input type="checkbox"/> 421 Surface water station <input type="checkbox"/> 423 Water stage or level <input type="checkbox"/> 425 Time of travel <input type="checkbox"/> 422 Ground water station <input checked="" type="checkbox"/> 424 Water discharge <input type="checkbox"/> 426 Drainage area						
18. STORAGE OF DATA						
<input type="checkbox"/> 501 Published <input type="checkbox"/> 503 Data on punchcard <input type="checkbox"/> 505 Other <input checked="" type="checkbox"/> 502 Not published <input type="checkbox"/> 504 Data on magnetic tape, disc, data cell, etc.						
19. INQUIRIES ABOUT DATA SHOULD BE SENT TO:						
Office Base Maintenance Department (Utilities Division)						
Street No. Marine Corps Base						
City, State, Zip Camp Lejeune, North Carolina 28542			City Code			
20. DATA ARE AVAILABLE TO PUBLIC ON REQUEST <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No						
21. OFFICE COMPLETING FORM Same						
22. COMPILER'S NAME Willard R. Price			23. DATE Jun 19 74 year			



Jarawa Terrace wells

- # 1 #1 well
Present Capacity 150,000 GPD
with a pumping level of 57' and has
varied from 57 to 64 ft over the
past ten years
Depth of well 95'
- 2 #9 well present Capacity 250,000 GPD
with a pumping level of 47' draw down
has varied from 46 to 50' over the
past ten years
Well drilled 1961 Depth 98'
- 3 #10 well present Capacity 250,000 GPD
with a pumping level of 66' draw down
has varied from 62 to 68' over the
past ten year, Well drilled 1961
Depth 90'
- (4) #11 well present Capacity of 200,000 GPD
with a pumping level of 60' draw down
has varied from 60 to 68' over the past
ten years, well drilled 1961, Depth 104'



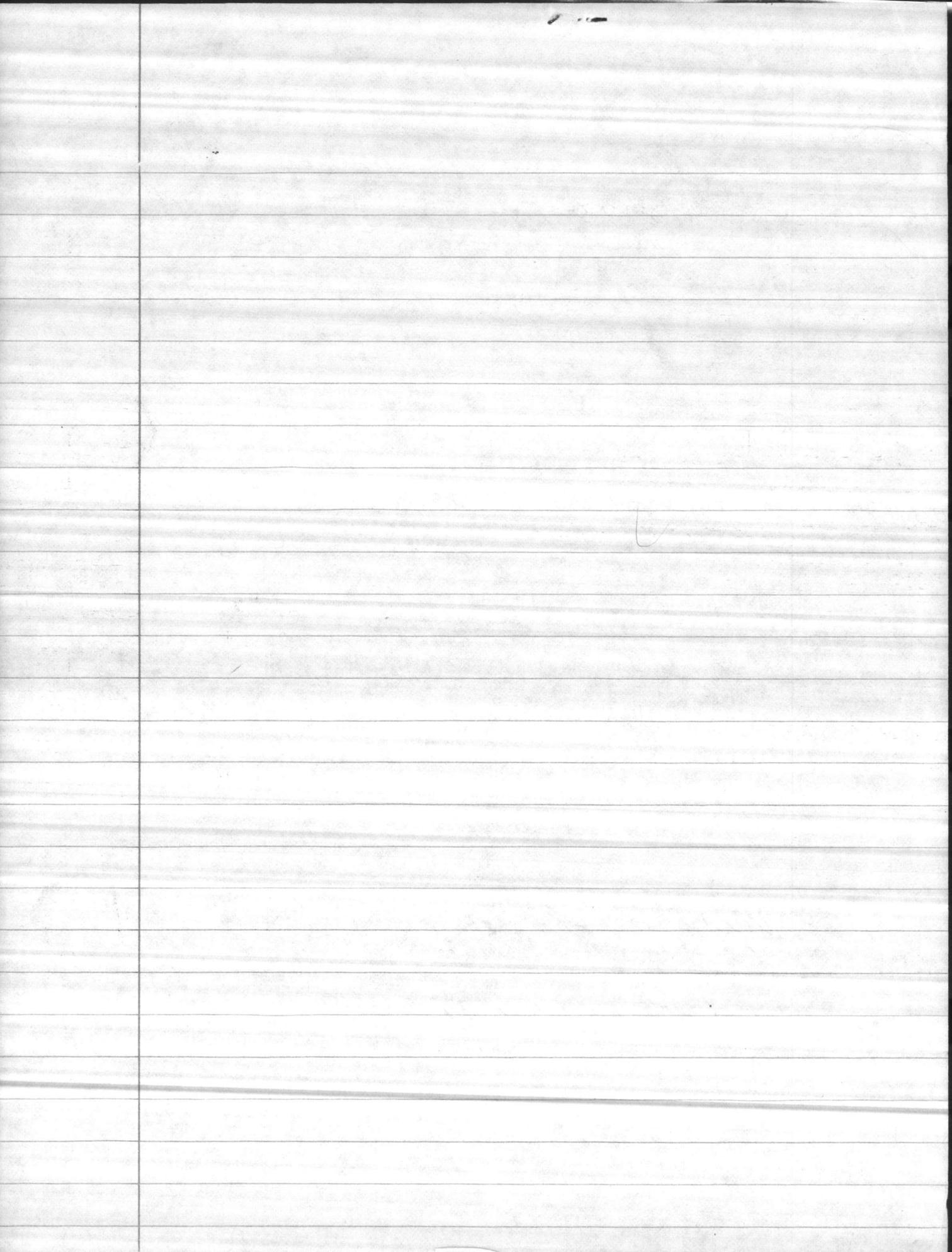
5 #12 well present capacity 120,000 GPD
with a pumping level of 64'
Date drilled 1972, Depth 110'
draw down has varied from 60' to 66'
over the past two years

6 #13 well present capacity 110,000 GPD
with pumping level of 62' date drilled 1972
Depth 98' draw down has varied from
60' to 66' over the past two years

7 #14 Well present capacity 120,000 GPD
with pumping level of 40' date drilled
1973 depth 94' draw down has varied
from 36' to 40'

Total Seven well present capacity 1,200,000 GPD

Variation of pumping level is very likely
due to slight change in pressure
and worn pumps.



Wells Tarawa Service

6-24-58

DATE	WELL #	G.P.M.	PUMP OFF GAGE READING STATIC	PUMP ON, DO. GAGE.	DISCHARGE	FT. AIR LINE
6-24-58	1	180	-	-	6 LB.	NONE.
"	2	75	-	-	8 LB	NONE
"	3	20	59 ft.	56 ft.	-	?
"	4	?	-	-	-	NONE.
"	5	70	-	-	10 LB	NONE.
"	6	80	78 ft.	57.	-	?
"	7	100	-	-	-	NONE
"						

Jarawa Laraca wells
Stage Readings by Direct Reading Gage
static (24 H₂O) DD.

# 8 -	13 ft.
# 9	23 ft.
# 11	22 ft.

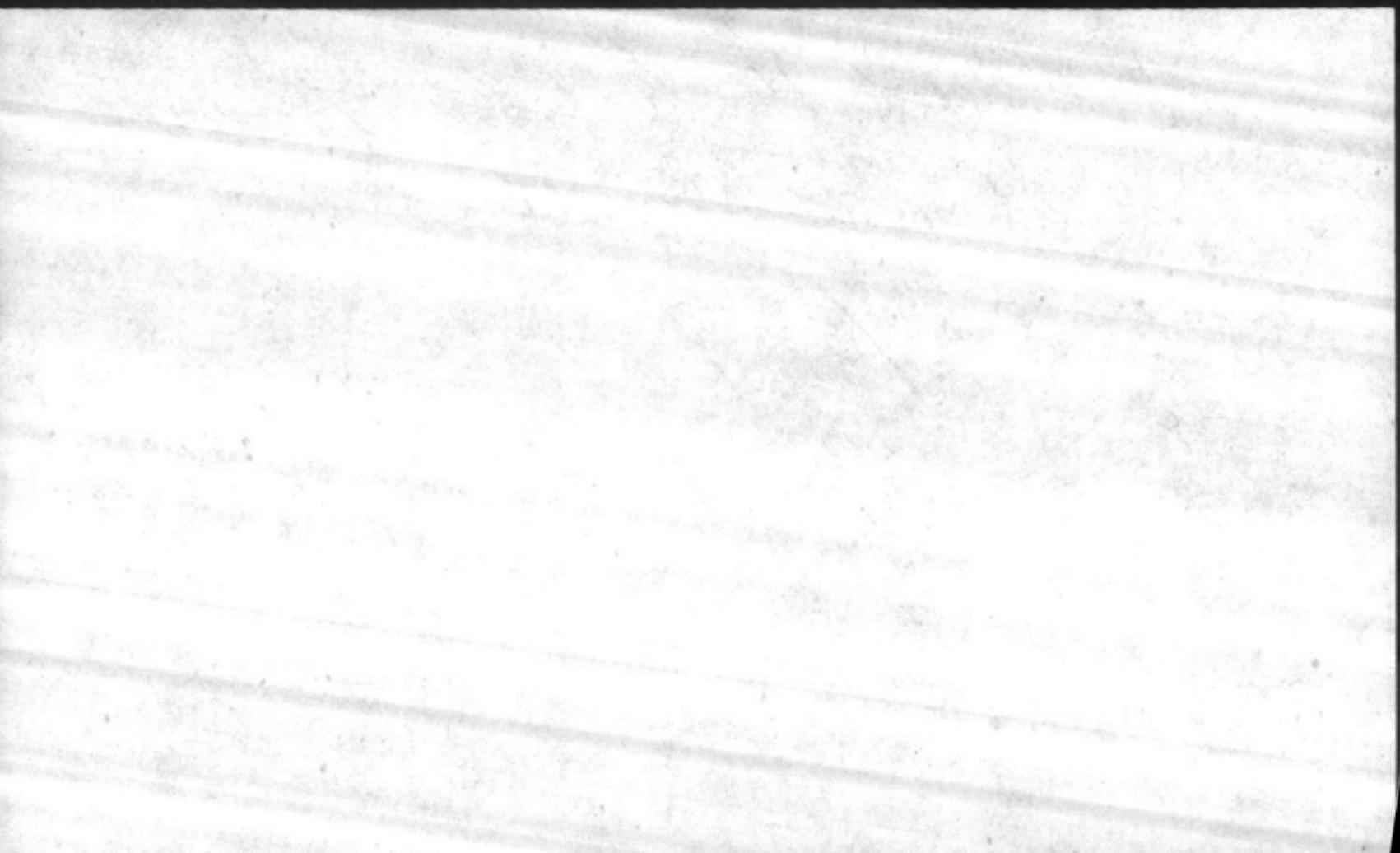
1. The first part of the book is devoted to a general introduction to the subject of the history of the world. It is a very interesting and well-written book, and it is well worth a read.

18th
19th
20th

#4 ~~142~~ High lift pump
pulled & repaired

5/25/77

T.T.38



65
35
90

SCORE!

USE

3-28-62

M.J. Grove Lime Company

PRODUCTS

LIME • STONE • FREE STATE MASONRY CEMENT • BUILDING SUPPLIES
GENERAL MERCHANDISE • STREET & ROAD CONSTRUCTION

#11 - Static - 18 ft. Stage ~~(2)~~

200 G.P.M. - 112 ft TOTAL HD

GAS MOTOR - 2300 RPM. 205 G.P.M.

Pump - 20 LB - 240 G.P.M.

air line - 65 ft

DD - 50 ft. Stage - (50)

#10 - static 16 ft. Stage -

350 G.P.M. at 121 ft Head

air line - 70 ft (54)

#9 - static 18 ft -

300 G.P.M. at 100 ft - (32)

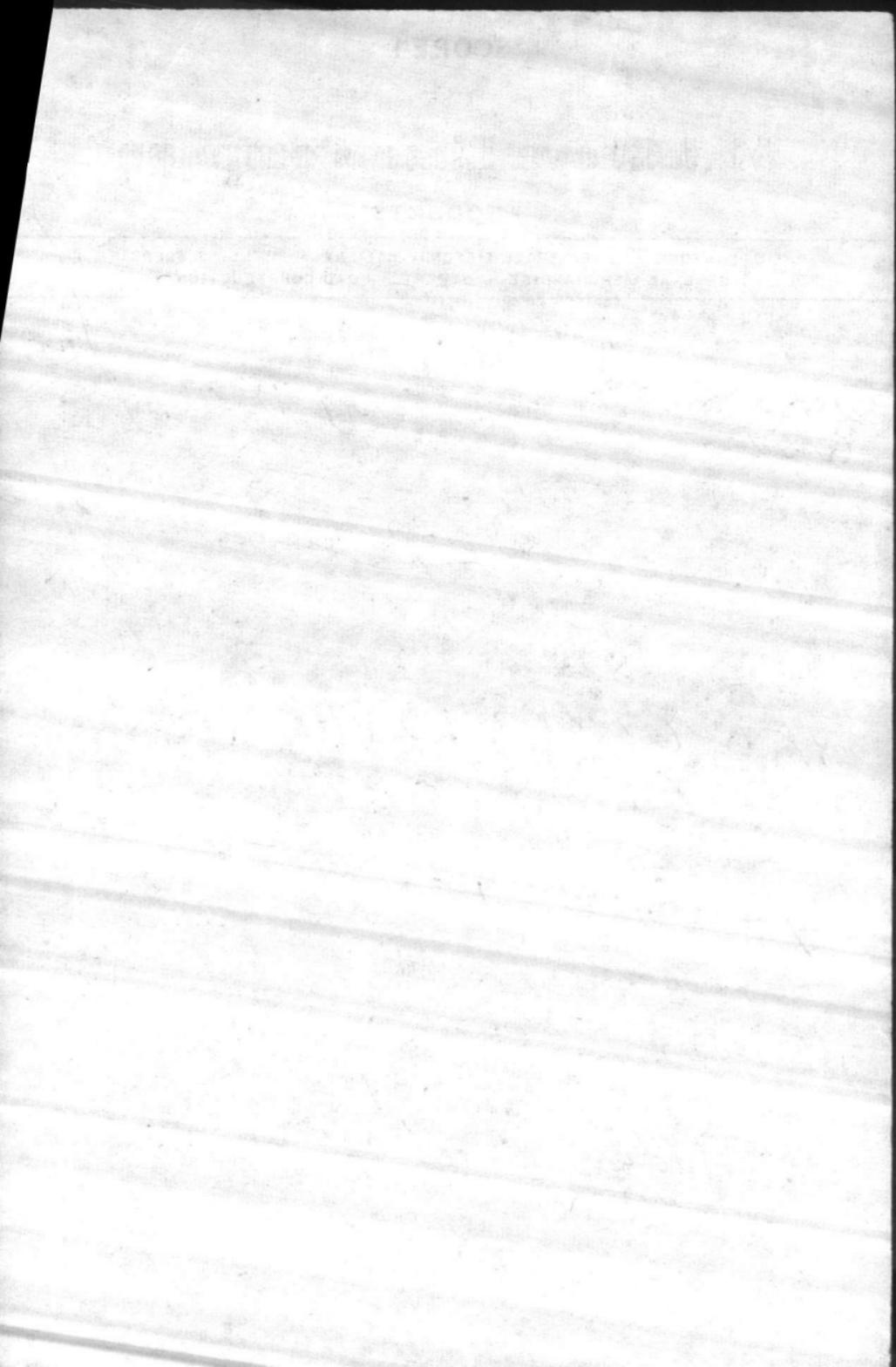
DD - 35 ft. PRESS - 65 ft -

air line 50 ft

#8. static 12 ft air line 50 ft

100 G.P.M. at 95 ft (30)

DD - 30 ft DISCHARGE - 65 ft -



Wells at TT

Well #: 9

Bld #: TT-52

Name: GENERAL ELECTRIC (Tri Clad) (oil lubricated)

Model: 5K4284XS202

H.P.: 15

RPM: 1760

Volts: 208-220/440

Amps: 39.8/19.9

Type: K

Frame: 284UP

Design: B

Code: F

Crise: 55

Time Rating: Cont.

Cycle: 60

Serial: ZVJ1222273

Phase: 3

JOHNSTON VERTICAL Pump

Serial No. JS-6235

Johnston Pump Co.

Pasadena, California

Depth:

Cdp. 300 GPM

at 101' Head; air line 50'

Pumping level 35'; Static 18'

discharge head 65'



Switch Box

Name: Square D Company

Class: 8536

Type: DA-1

Form: A

Series: A

Reset + Starter

Panel Box

Name: Square D Company

Type: M L S

Amp: 150

Volts: 120/208

Phase: 3

Catalog No: M L S-2-3450-2A

MAIN for motor + lights

Well #: 10

Bld #: TT-53

Name: General Electric

Model: SK4284XS2C2

HP: 15

RPM: 1760

Volts: 208-220/440

Amps: 39.8/19.9

Type: X

Frame: 284UP

Design:

Code: F

CRise: 55

Time Rating: Cont.

Cycle: 60

Serial: ZVJ122241

Class: B

Phase: 3

BACK Pressure Valve

Model: 5DRWR

Serial: 6150

Johnston Vertical Pump

Serial: JS-6138

Right Angle Drive

Name: Johnson

Serial: 32835

Ratio: 4-3

RPM: 1760

HP: 15

Gas motor

Name: Wisconsin

Model: VF40

Serial: 3366110 4 cylinders

Size: 3 $\frac{1}{4}$ - 3 $\frac{1}{4}$

Spec: 204555

Main Switch Box (for motor flights)

Name: Square D Company

Amps: 150

Volts: 120/208

Phase: 3

Wire: 4

CAT: MLS-2-3450-2A

Reset Switch Box + starter

Name: Square D Company

Class: 85-36

Type: DA-1

Frame: A

Series: A

Booster Station Bld: D-39

Electric Motor

Name: FAIRBANKS-MORSE ✓
 HP: 10 ✓
 Phase: 3 ✓
 Cycle: 60 ✓
 Volts: 208-220/440 ✓
 Amps: 28-26.4/13.2 ✓
 SF: 1.15 ✓
 Code: F ✓ Pump
 Duty: 24 ✓ Fairbanks & Morse
 Crise: 40" ✓ No. K 7344
 RPM: 1450 ✓ Size - 2" 5313
 Type: QZK ✓
 Frame: RS324 ✓
 No. : F 213516 ✓
 Spec.: 2863-2 ✓

Solenoid Switch (B.P. Valve)
 Name: ASCO
 Made by: Automatic Switch Co.
 Cat. #: WP83009G MO
 Max Pressure lb: 250
 Volts: 230 for Back pressure
 Cycle: 60
 Serial: 82104H done Value

Solenoid Switch (B.P. Valve)
 Name: ASCO
 Made by: Automatic Switch Co.
 Cat. #: LM83441
~~Serial: 61990H~~ for Back pressure
 Volts: 230
 Cycle: 60 done Value

for Start + Stop Switch Box
 Name: Cutler-Hammer

Meter Head (for meter reading)
 Name: Anchor
 Type: ST-8 done
 Serial: 1205082 done

Time Relay Switch Box
 Name: Autocow
 Made by: Automatic Control Co. Starts and stops motor automatically

Switch Panel (for lights)
 Name: Electric-Center done

OFF + ON Switch Box automatic controls for motor
 Name: Wads Worth
 Amp: 30
 Volts: 120/240 done
 Poles: 3
 Cat. #: NSD25F (don't forget)

MAIN Switch Box for lights
 Name: Square D Company
 Cat. No: A87413
 Series: C2
 Volts: 240
 Amp: 100
 HP: 15 done

Designed to boost water from M. P. System into TT system

BU: TT-54 well house #11 cont.

Right angle Drive
Name: Johnson Gear

Serial: 32836

BHP: 15 at

RPM: 1760

Ratio: 4-3 → H A 15

Berkeley, Calif.
Mfg. Co.

Johnston Vertical Pump

Serial No. JS-6139

Johnston Pump Company

Pasadena, California

(oil lubricated)

Gas Motor

Name: Wisconsin

Model: VF40

Serial No.: 3366111

~~HPA: A~~

Size: 3 1/4 X 3 1/4

Spec. No.: 204555

4 up.

Depth. - Cap. 200 GPM at

112 ft. head; air line 65'; Pumping level 55 ft.; static 18 ft.; Discharge head 62 ft.

Back Pressure Valve

Model No.: 50RWR

Serial No.: 61504

Electric Control Switch Box

Class: 8536

Type: DA-1

Form: A

Series: A

Name: Square D Company

Reset + Starter for motor

MAIN for Motor + Lights
Big Control Panel

Amps: 150

Volts: 120/208

Phase: 3

Catalog No.: MLS-2-3450-2A

Well 10 Dept. TT-53 Well # 10
CAP. 350 GPM at 121' Head; airline 70';
Pumping level 60'; static 16'; discharge head 50ft.

Johnston Vertical Pump (oil lubricated)

serial: JS-6 138

Size: 10 X 6

Johnston Pump Company, Pasadena, Calif.

Right Angle Drive

Johnson Gear and Manufacturer Co.

Berkeley, California

SERIAL No. 3 2835 ; H. A15 ; Ratio 4-3 ;

B.H.P. 15 ; RPM: 1760.

1 ea Check Valve 6" Mueller, 175 WP

1 ea Gate Valve 6" " 175 WP 350 Test

1 ea Gate Valve 4" " " "

Blud off

1 ea Air Release Valve Multiplex Mfg. Co.
Berwick, Pa.

Well # 9

Bldg. 52

1 ea Check Valve 6" Mueller CHATTA, TEXN.
175 WP

1 ea Gate Valve 6" " " "
175 WP 350 Test

1 ea ^{Blind Off} Gate Valve 4" " " "
175 WP 350 Test

1 ea Air Release Valve Multiplex. Mfg. Co.
Berwick, Pa.

1 ea Back Pressure Valve Ross Valve Mfg. Co. Inc.
Model 5 ORWR Troy, N.Y.
Serial 61505

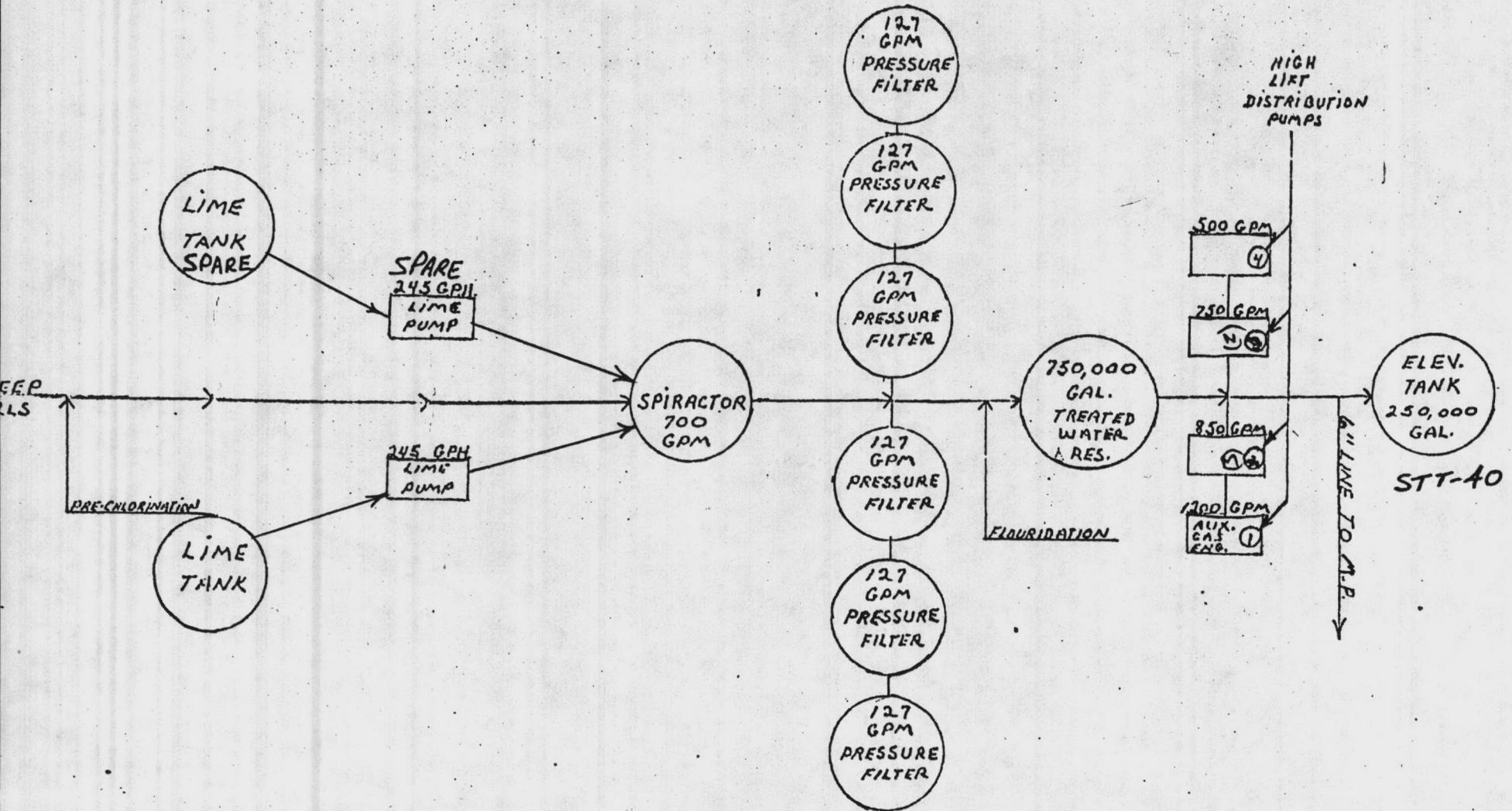
Done

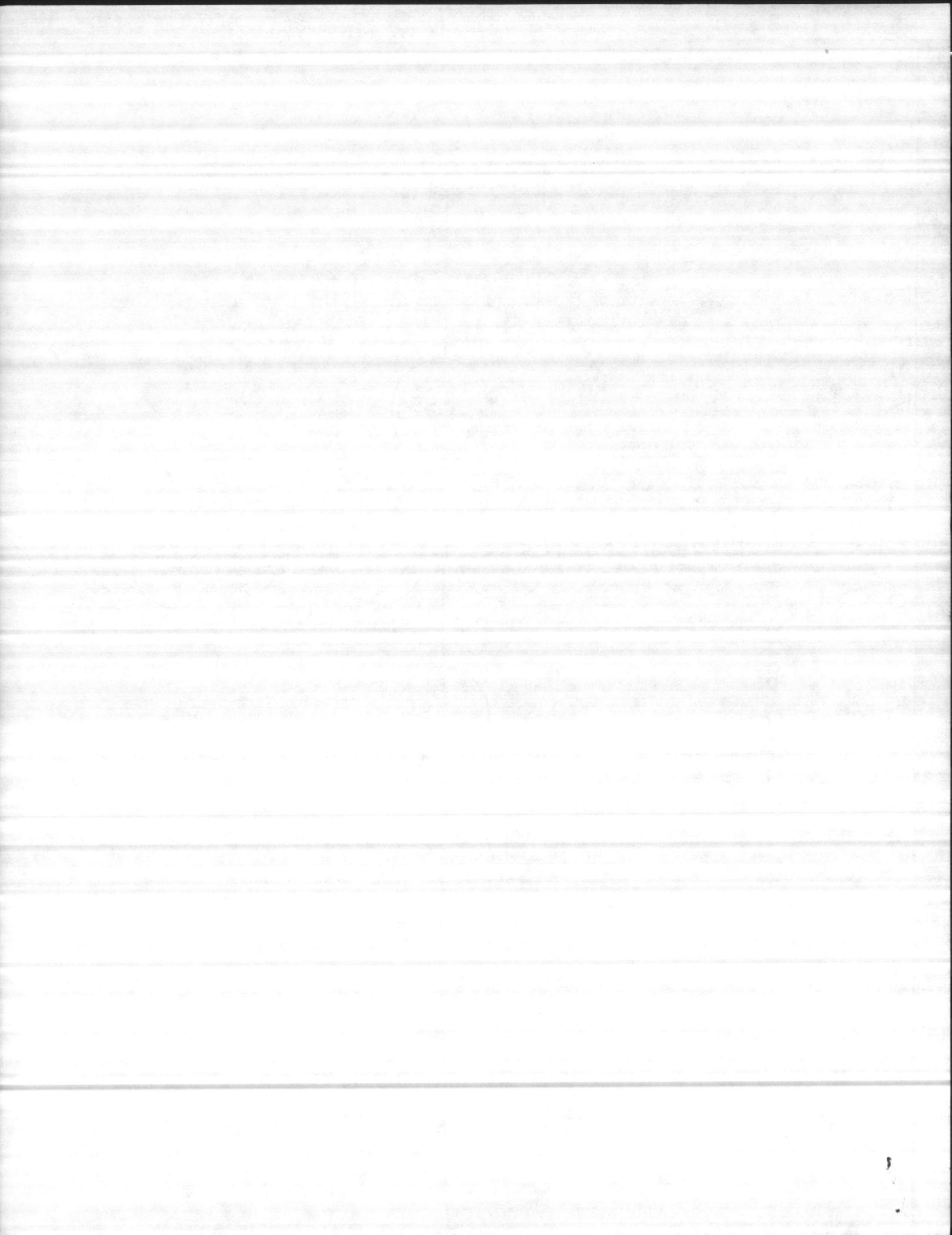
TARAWA TERRACE BLDG. TT-38

CAPACITY 1 MGD

WITH 7 DEEP WELLS

LIME SOFTENING PLANT





TARAWA TERRACE POOL - TT-20

298,800 GALLONS

POOL EQUIPPED WITH
IFRS PERIMETER
RIM FLOW

SURGE TANK

800 G.P.M.
FILTER PUMP

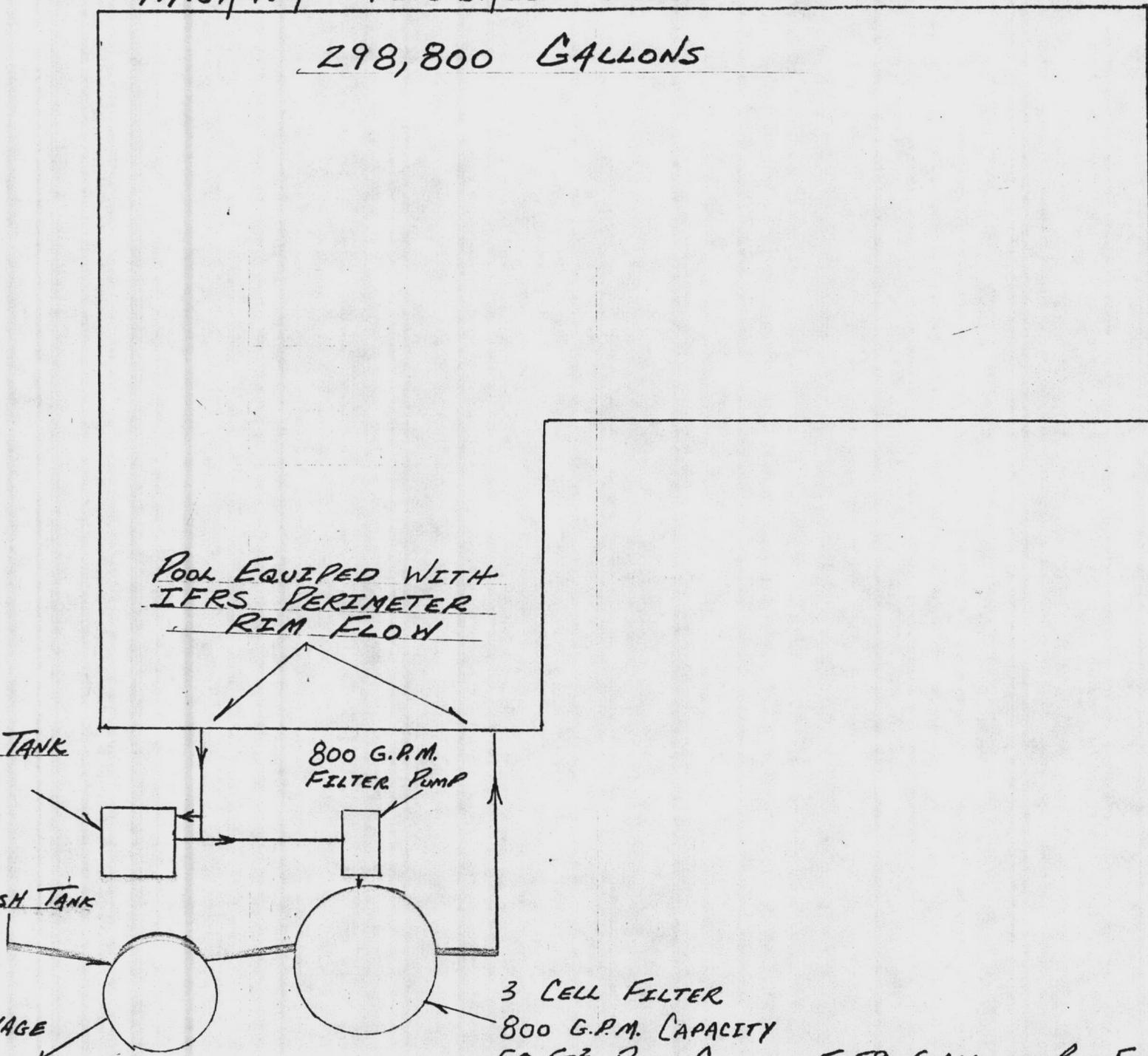
BACK WASH TANK

3 CELL FILTER

800 G.P.M. CAPACITY

50 FT² PER CELL - 5.59 GALLONS PER FT² PER CELL

TO SEWAGE
SYSTEM





Water Treatment etc.

O. Wells

50. Unit # 1 - Well, RAW Water Bldg. # TT-26

~~Depth: 95 feet, Diameter: 16 inches, Cased to:~~
95 feet, yield: 135 gpm at 51 feet.

(a) Well pump, Dual Drive (Electric and Gasoline)

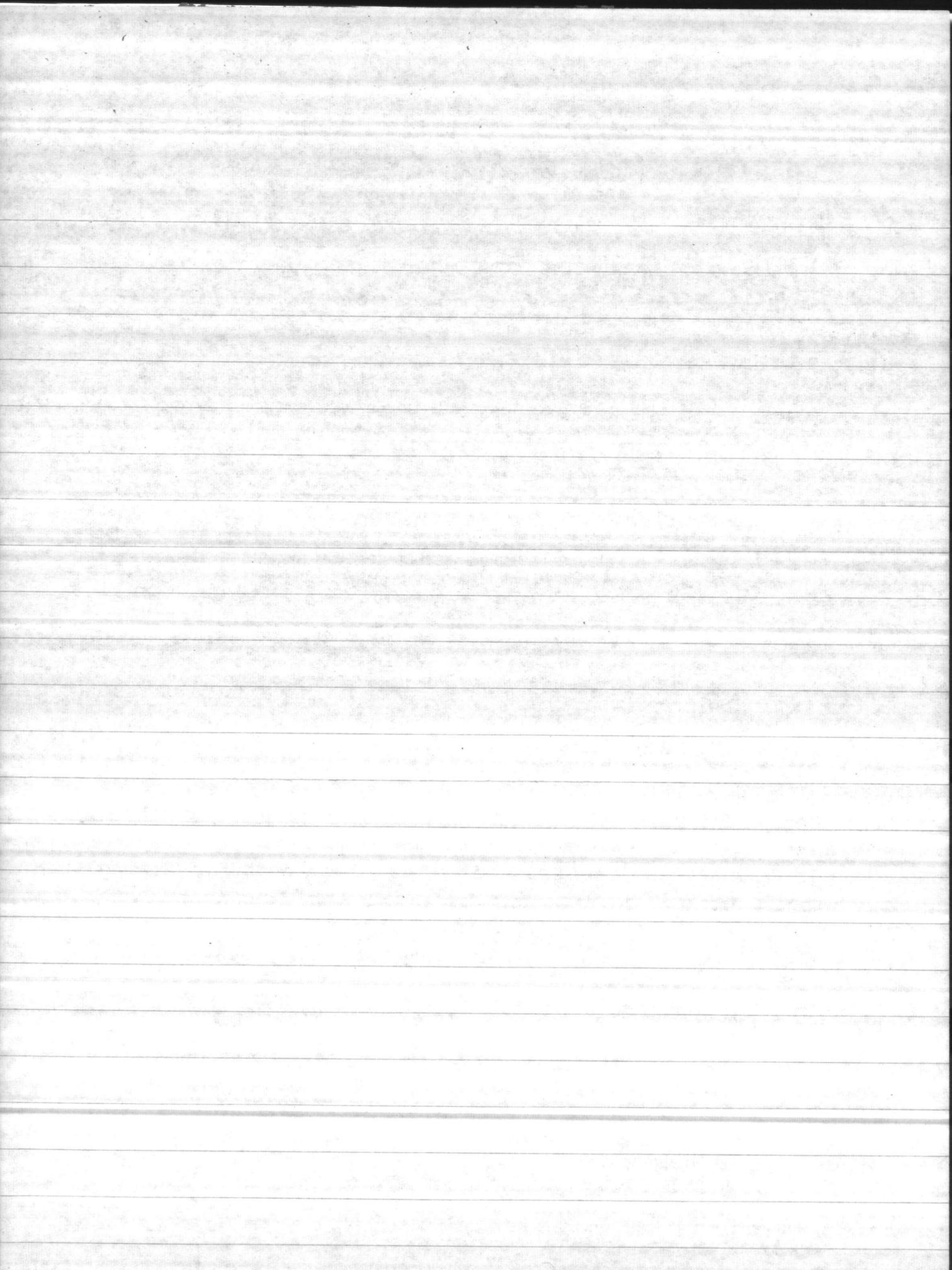
NAME: FAIR BANKS and MOUSE; Manufacturer:
Fairbanks, mouse and company, Fairbanks-
mouse Building, Chicago, Ill.

Type: Horizontal Centrifugal; Serial No.
FM-3355.

(1) Motor; Electric; Name: General Electric;
Manufacturer: General Electric, Schenectady,
New York.

Type: K; Model No. 5K284XA52A;
Serial No. RH56875729; Frame: 284P;
HP: 10; Cycles: 60; RPM: 3480; Amps:
25.6 / 12.8; Volts: 220 / 440; Phase: 3;
Code: G; C Rise: 40.

(aa) Switch, Electric (Start, Stop,
Reset, and Motor)



Name: monitor; Manufactures: N/A;
Type: 6333AB1; Number: 328294;
Volts: 220; HP: 3; Cycles: 60.

(2) Motor, Gasoline; Name: Wisconsin; Model
No. VE4; Serial No. 1771824; Spec. No.
49744; Size 3 X 3 1/4; Cylinders: 4.

(3) Clutch, Mechanical; Name: Rockford;
Manufactures: Rockford Clutch Division,
Rockford, Ill.
Serial No. 162903

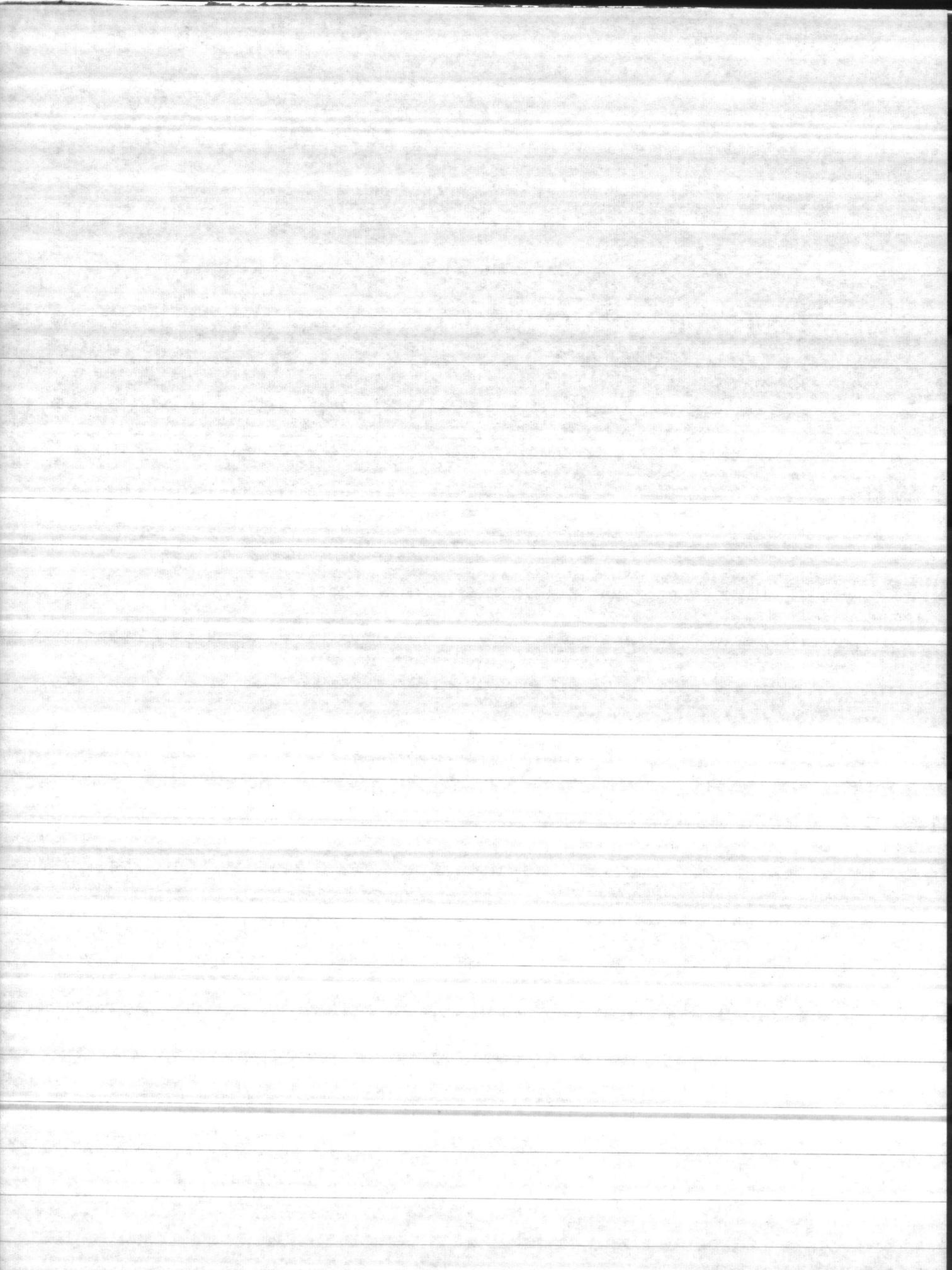
(4) Meter, Water (not in operation) Name:
Sparkling; Manufactures: Sparkling Water
Control Equipment
Number: 5267

(5) Panel, Electric (main for motor, lights, and
meter) Name: Cutler-Hammer; Manufactures:
N/A.

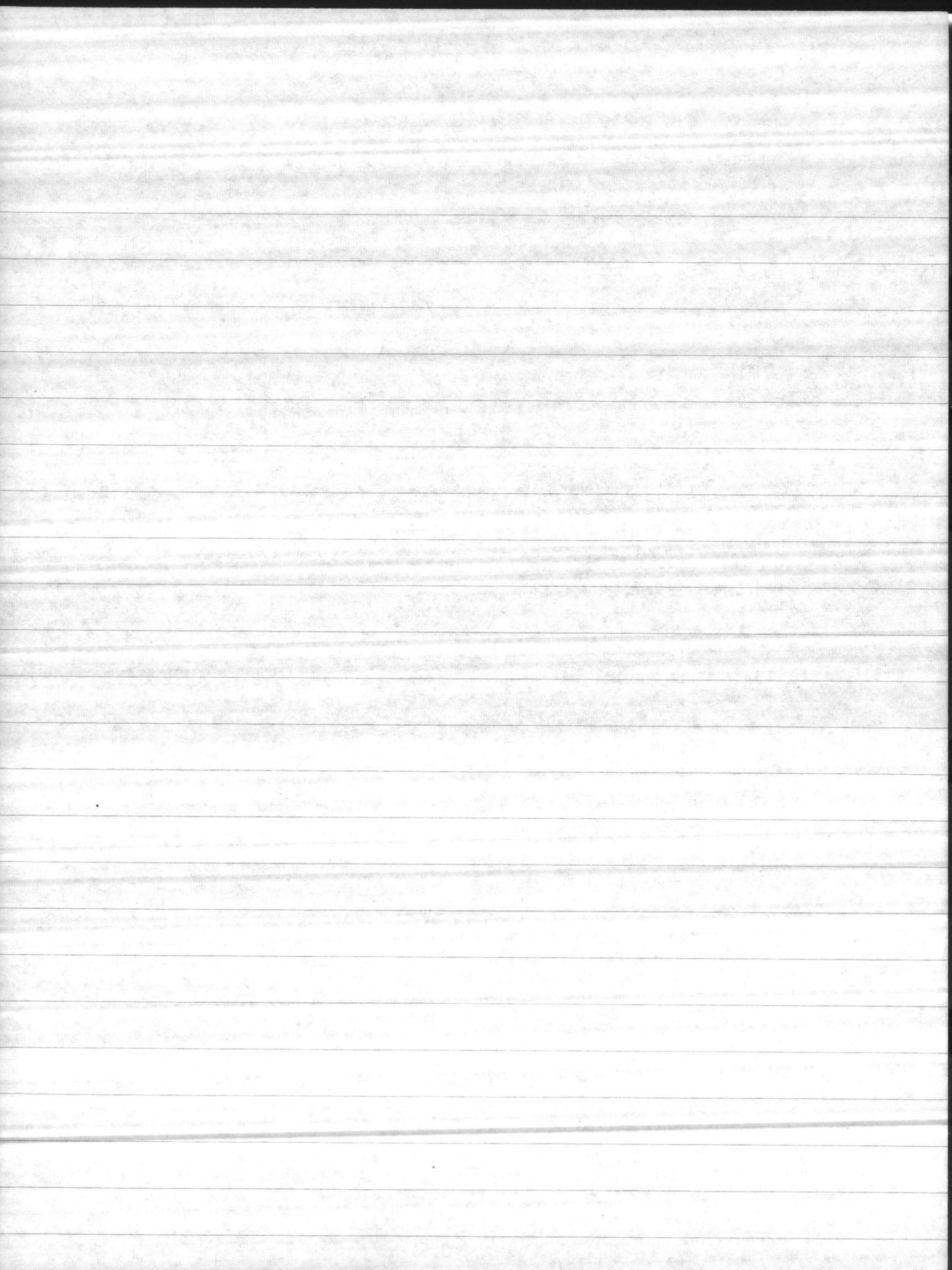
(aa) Panel, Electric (for lights) Name:
Murray; Manufactures: N/A.

(6) Valve, Check; Jenkins; 4 inches; 125
WSP; 200 OWG.

(7) Valve, Gate; Mueller; 4 inches; 150 W,
300 Test.



(8) Valve, Gate, ; 2 inches

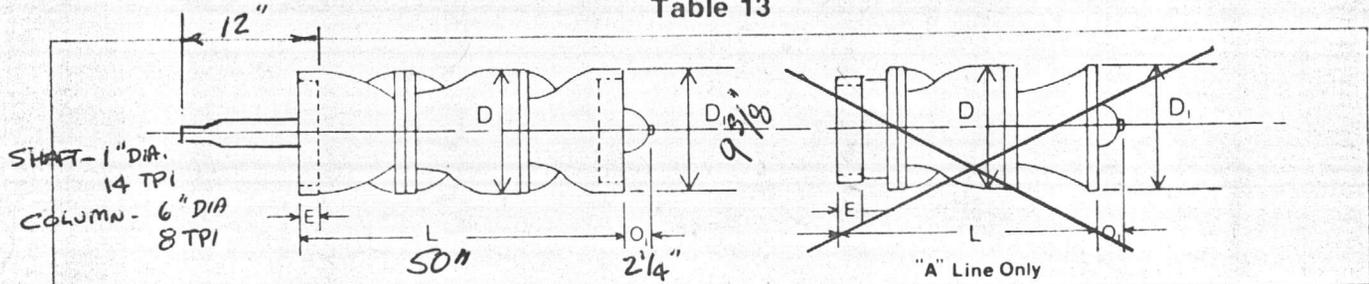




GOULDS DWT 10JMO/4 STAGE BOWL ASSY.

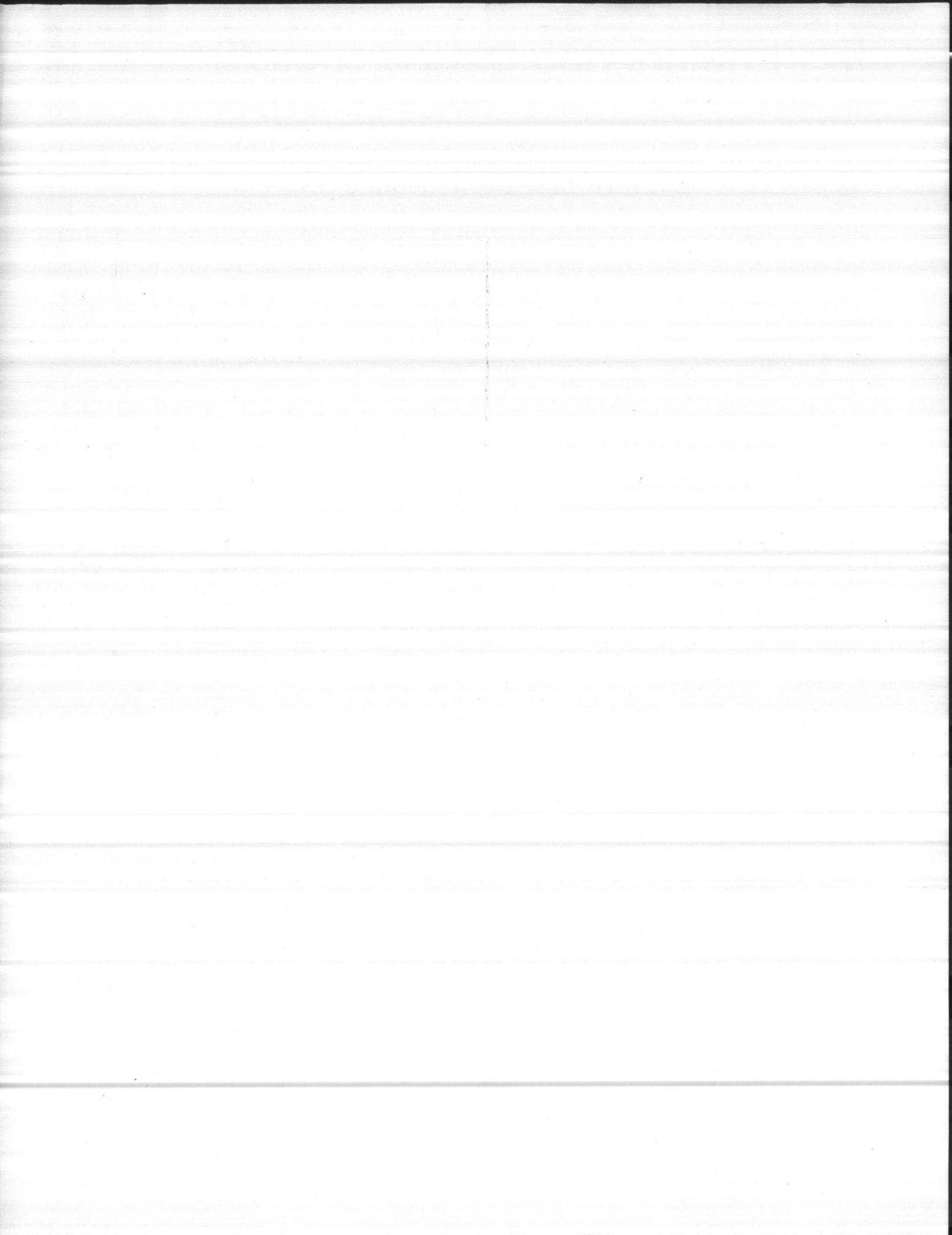
DWT Turbine Bowl Mechanical Data

Table 13



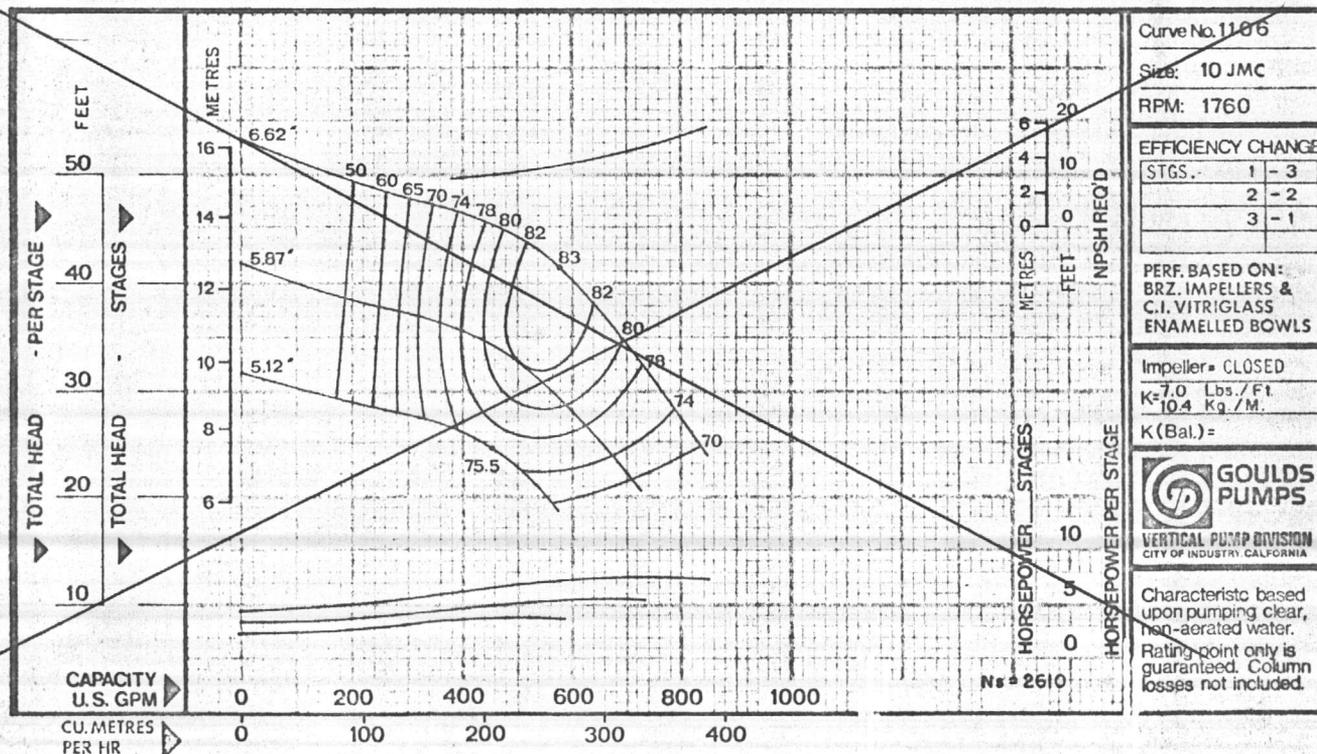
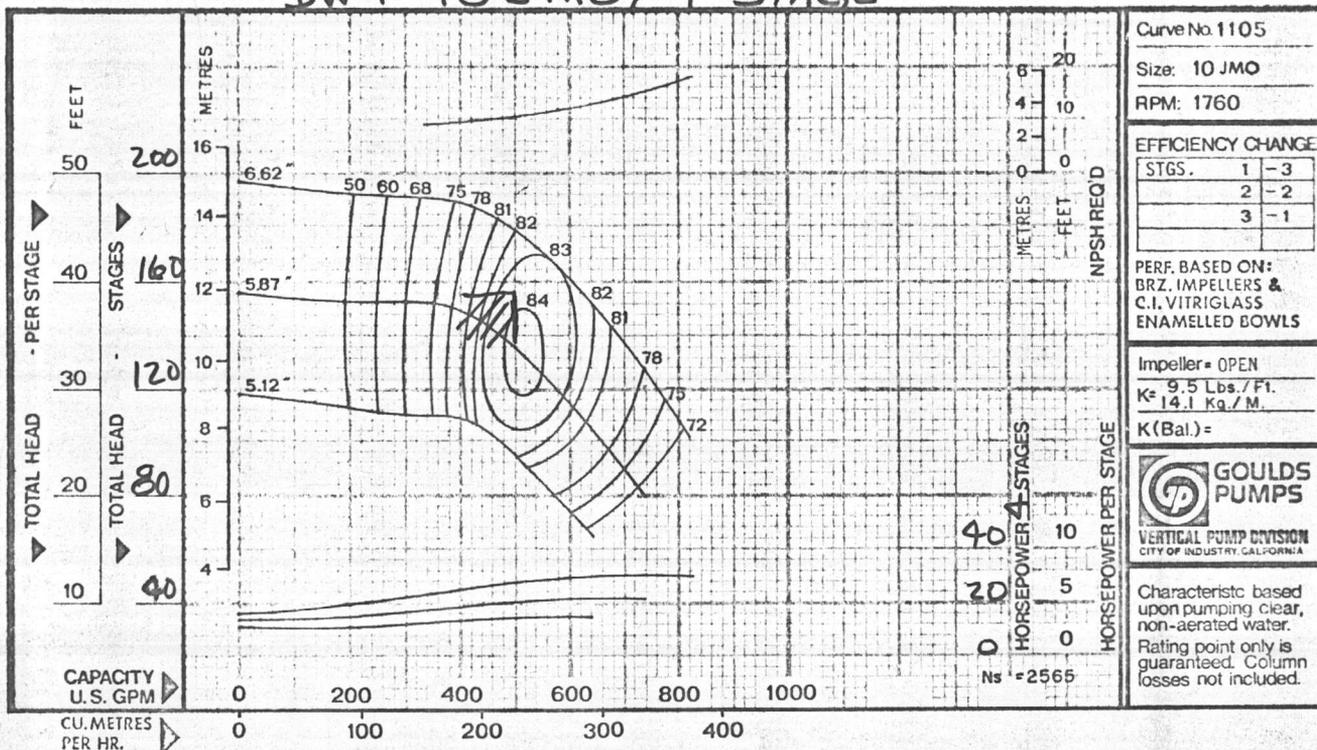
Bowl Size	Bowl Assembly Length (in.)			O ₁ (in.)	Inter Bowl D (in.)	Suction Bell D ₁ (in.)	E Thread Length in Disch. Bowl (in.)	Bowl Shaft Size (in.)	Available Lineshaft Sizes (in.)	Available Column Sizes (in.)	Available Suction Pipe Sizes (in.)	Bowl Assembly Weights (lbs)			Available Disch. Head Sizes (in.)		
	First Stage L'		Each Add'l. Stage									Open Shaft	Enclosed Shaft	Each Add'l. Stage		Open Shaft	Enclosed Shaft
	Open Shaft	Enclosed Shaft															
6D	14 1/4	NA	5 1/2	1	5 1/2	5 1/2	1 1/8	1	1	3	4	47.5	57.0	16.0	4.6		
6J	13 3/4	NA	5"	1/2	5 1/2	5 1/2	1 1/8	1	1	3	4	47.5	57.0	17.0	4		
8D	17 1/4	21 1/4	7 1/2	2 1/4	7 1/2	7 1/2	1 1/8	1 1/8	1, 1 1/16	6	6	97.0	112.0	34.0	6		
8J	17 1/2	21 1/2	6 1/2	1 1/2	7 1/2	7 1/2	1 1/8	1 1/8	1, 1 1/16	4, 5, 6	5	102.0	117.0	38.0	4.6		
9C*	22 1/2	22 1/2	7 1/2	1 1/2	8 1/2	7 1/2	2"	1 1/2	1 1/2	6", 8"	6"	125	137	51.7	6"		
10D	22 1/4	27 1/4	9 1/4	3 1/4	9 1/4	9 1/4	2"	1 1/2	1 1/2	6, 8	8	201.0	236.0	64.0	5.8		
10J	21 1/4	26 1/4	9	2 1/4	9 1/4	9 1/4	2"	1 1/2	1 1/2	6, 8	6	190.0	220.0	76.0	6.8		
10L	23 1/4	27 1/4	8 1/4	3 1/4	9 1/4	9 1/4	2 1/8	1 1/2	1 1/2	6, 8	8	195.0	225.0	64.0	6.8, 10		
12D	26 1/4	32 1/4	11 1/4	4 1/4	11 1/4	11 1/4	2 1/4	1 1/2	1 1/2	8, 10	10	297.0	347.0	129.0	8, 10		
12J	25 1/2	30	10 1/4	1	11 1/4	11 1/4	2 1/8	1 1/2	1-1 1/16	6, 8, 10	8	284.0	325.0	120.0	6.8, 10		
14D	27 1/4	37	13 1/4	5	13 1/4	13 1/4	2 1/4	2 1/8	1 1/2	10	12	459.0	530.0	169.0	10, 12		
14J	31 1/2	35 1/2	13 3/4	1 1/4	14	14	2 1/4	1 1/2	1 1/2	8, 10, 12	10	513.0	577.0	196.0	8, 10, 12		
14H	30 1/4	40 1/4	13 3/4	3 1/2	14	14	2 1/4	2 1/8	1 1/2	10	10	493.0	568.0	195.0	10, 12		
16D	34 1/4	43 1/4	15 1/4	4 1/2	15 1/4	15 1/4	2 1/4	2 1/8	1 1/2	12, 14	14	659.0	764.0	281.0	12, 14		
18B*	21 1/2	35 1/2	13	3 1/2	17 1/2	17 1/2	2 1/4	2 1/8	1 1/2	12, 14	14	843.0	975.0	374.0	12, 14		
18H	38 3/4	43 3/4	17 3/4	3 1/2	18	18	2 1/4	2 1/8	1 1/2	12, 14	14	778	917	371	12, 14		
"A" Line ²																	
6A*	11	NA	3 1/4	4	5 1/4	5 1/2	1 1/8	1	1	3, 4	NA	44	NA	17	4		
7A*	12 1/2	NA	4 1/2	3 1/2	6 1/4	5 1/2	1 1/8	1 1/16	1 1/16	3, 4	NA	51	NA	24	4		
8A*	12 1/2	NA	5	3 1/2	8	6 1/4	1 1/8	1 1/16	1 1/16	4"	NA	60	NA	29	4		
9A*	13 1/2	NA	5 1/2	5 1/4	8	6 1/4	1 1/8	1 1/2	1-1 1/2	4, 6	NA	92	NA	46	4.6		
10A*	15 3/8	NA	6 1/4	6 1/4	9 1/8	7 1/4	1 1/8	1 1/2	1-1 1/2	4, 6	NA	122	NA	66	4.6		
11A*	17 1/4	NA	8	6 1/2	11	9 1/4	2"	1 1/2	1 1/2	6, 8	NA	174	NA	95	6.8		
13A*	27 1/4	NA	9 1/2	5 1/2	13 1/4	12 1/4	2 1/4	1 1/2	1 1/2	8", 10"	NA	260	NA	148	8, 10		

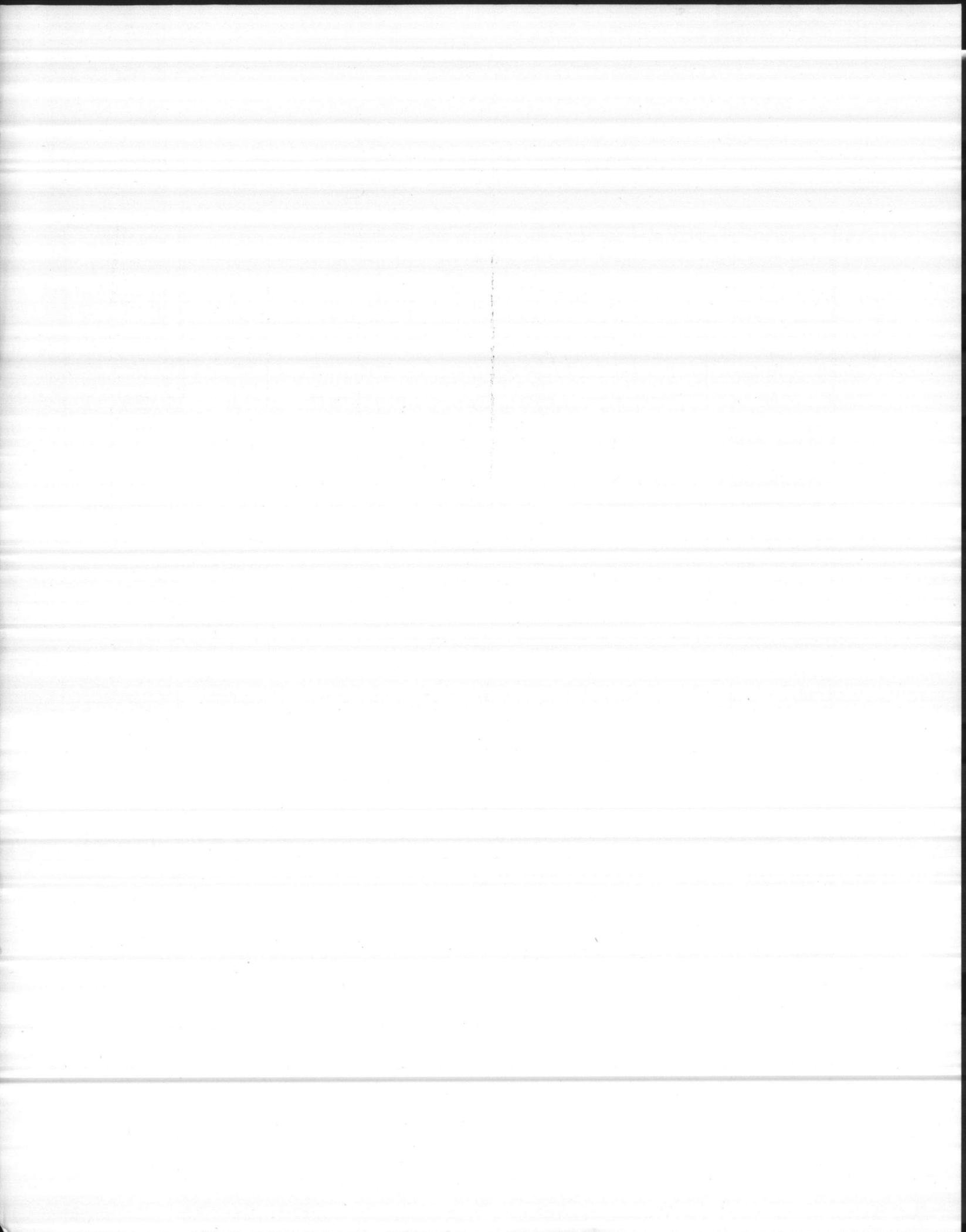
- (1) Unless otherwise noted first stage bowl assembly consists of: suction bowl for threaded suction pipe, intermediate bowl and discharge bowl for threaded column.
- (2) Available with suction bell only
- (3) Discharge bowl available only with enclosed lineshaft. Flanged bottom column section used for open lineshaft
- (4) Thrust balancing available with these sizes.



GOULDS PROPOSAL NO	GOULDS SO NO	CUST INQUIRY NO	CUSTOMER PO NO M47001-80 M-3923	PO DATE 1-3-80	ITEM NO	PAGE 5C21
CUSTOMER U.S.M.C. CAMP LEJEUNE, N.C.						DATE 10/15/79
PROJECT TT 38 Pump #4						SUPERSEDES 5/25/77
SERVICE WATER	GPM CAPACITY 500	FT TDH 154'	% EFFICIENCY 83%	RPM 1760		

DWT 10JMO/4 STAGE







GOULDS PUMPS

VERTICAL PUMP DIVISION

Installation, Operation and Maintenance Instructions

*IMPELLER ON # 4
SERVICE PUMP TT.38*

Model DWT

Deep Well Turbine Pumps

TENCARVA MACHINERY CO.
P. O. BOX 3407
WILMINGTON, N. C. 28406
PHONE (919) 799-8800

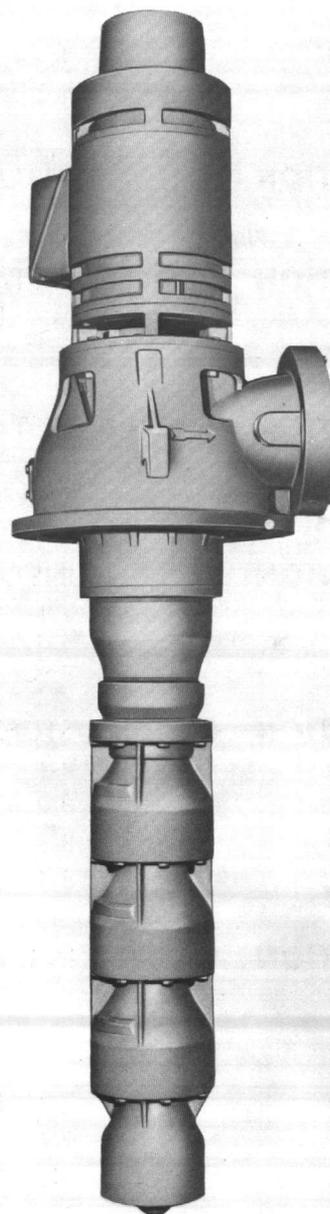


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SECTION 1

INTRODUCTION

1-1. INTRODUCTION

1-2. The design, material, and workmanship incorporated in the construction of Goulds Pumps makes them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by correct application, proper installation, periodic inspection and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of installing, operating and maintaining these pumps.

Study thoroughly Sections 1 - 13 and carefully follow the instructions for installation and operating. Sections 14 - 16 are answers to trouble and maintenance questions. Keep this instruction manual handy for reference. Further information can be obtained by contacting the Vertical Turbine Division, Goulds Pumps, Inc., City of Industry, California or your local branch office.

WARNING: Goulds Pumps, Inc. will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual.

1-3. RECEIVING AND CHECKING

1-4. The pump shall be carefully supported prior to unloading from the carrier. Handle all components carefully. Inspection for damage of the shipping crate shall be made prior to unpacking the pump. After unpacking, visually inspect the pump, and check the following:

- A. Contents of the pump assembly against shipping list.
- B. All components against damage.
- C. The shaft is not bent.

1-5. Any shortages or damages should be immediately called to the attention of the local freight agent of the carrier by which the shipment arrived and proper notation made on the bill. This shall prevent any controversy when claim is made and facilitate prompt and satisfactory adjustment.

1-6. MATERIALS AND EQUIPMENT REQUIRED

1-7. The material and equipment necessary for installation of the pump, will vary with the size of the pump and the type of installation. The following list of standard tools and supplies are offered only as a guide.

A. BULK MATERIAL

- Anti-Galling Lubricant such as ("MOLYKOTE" DOW CORNING).
- Thread Compound
- Lubrication Oil
- Turbine Oil (SEE SECTION 17)
- Grease (SEE SECTION 17)
- Solvent, petroleum-base (kerosene, distillate or unleaded gasoline)
- Grouting material, non-shrinking

B. RIGGING EQUIPMENT

- Mobile power hoist; or a traveling crane; or a derrick
- Dragline and blocks
- Deep throat clamp
- Elevator clamps
- Clevises — for use with eyebolts
- Capstan drive (Cat head and cat line) for making threaded joints (optional)
- Timbers — size, length and quantity as required to support long pump parts on the floor
- I-Beams or timbers to support pump over well
- Tail rope — size and length as required

C. HAND TOOLS

- Pipe wrenches
- Chain tongs
- Chain wrench (clamp type)
- Clean rags
- Feeler gages
- Set of mechanic's tools including: files, wire brush, pliers, wirecutters, pocket knife and pipe wrenches

OPTIONAL TOOLS TO FACILITATE PUMP ASSEMBLY AND DISASSEMBLY:

All pumps:

1. Ammeter to assist in final impeller adjustment (SEE SECTION 13).

All pumps with impeller taper collets:

1. Collet hammer to assist in bowl assembly and disassembly (SEE SECTION 16).

Oil lubrication (enclosed line shaft).

1. Tube tension adapter. (SEE SECTION 9).
2. Dynamometer Scale.

SECTION 2 STORAGE

2-1. STORAGE

2-2. Goulds Pumps carefully preserves and protects its products for shipment. However, the effective life of the preservatives applied at the factory can vary from 3 to 18 months depending on the severity of the environment in which the equipment is stored. This section provides procedures for preparation prior to storage and maintenance during storage of Goulds' pumps. These procedures are necessary to protect the precision parts of the pumps. Specific procedures for storing motors, gear-heads, and engines, should be obtained from the equipment manufacturer. This section is intended to be of general assistance to users of Goulds' pumps. It shall not modify, amend and/or otherwise alter the scope of Goulds Pumps warranty in any way whatsoever.

2-3. STORAGE PREPARATION

2-4. Goulds vertical pumps require proper preparation for storage, and regular maintenance during storage. The pump shall be considered in storage when it has been delivered to the job site and is waiting installation. If a pump has been installed but is not in regular operation, such as seasonal shutdown, see Section 14.

2-5. RECOMMENDED STORAGE PROCEDURES

A. Controlled storage facilities should be maintained at an even temperature 10°F or more above the dew point with relative humidity less than 50% and little or no dust. (If these requirements cannot be met the pump is to be considered in uncontrolled storage).

B. For uncontrolled storage periods of 6 months or less, the pump is to be inspected periodically to insure that all preservatives are intact.

C. All pipe threads and flanged pipe covers are to be sealed with tape.

D. The pump must not be stored closer than 6 inches to the ground.

2-6. PREPARATIONS FOR UNCONTROLLED LONG TERM STORAGE

2-7. Storage periods over 6 months require the preceding uncontrolled storage procedure plus the following:

A. Inspect the lube oil and seal flush piping, and either fill the piping with rust preventative oil, or recoat the piping periodically to prevent corrosion.

B. Place 10 pounds of moisture absorbing desiccant or 5 pounds of vapor phase inhibitor crystals near the center of the pump. If the pump is assembled, place an additional one pound in the discharge nozzle securely fastened to the discharge flange.

C. Install a moisture indicator near the perimeter of the pump. Cover the pump with 6 mil minimum thickness black polyethylene or equal and seal it with tape. Provide a small ventilation hole approximately 1/2 inch diameter.

D. Provide a roof or a shed shelter to protect from direct exposure to the elements.

SECTION 3 PREPARING THE SITE

3-1. PREPARING THE FOUNDATION

3-2. The foundation must be rigid, level and of adequate strength to support the complete weight of the pump plus the weight of the liquid passing through it. Weight data is given on the Certified Pump Outline Drawing, if provided, or may be calculated from data given in Section 17. For fluid weight see Table 17-5 (SECTION 17). Concrete foundations shall have bolts with a pipe sleeve 2 1/2 times the bolt diameter embedded in the concrete, sized and located in accordance with the dimensions given on the Pump Certified Outline Drawing or

established by actual measurement of discharge head or subbase mounting holes. The pipe sleeve allows movement for final positioning of the foundation bolts. A dam for grouting shall be constructed. (SEE FIGURE 3-1). Occasionally there is a gradual settling of the ground around a well. If settling is anticipated pour a foundation on opposite sides of the well, outside the area of potential settling, and bridge across the well with suitable I-Beams to carry the weight of the pump. When mounted directly on a structural steel frame, the pump shall be located directly over or as near as possible to the main

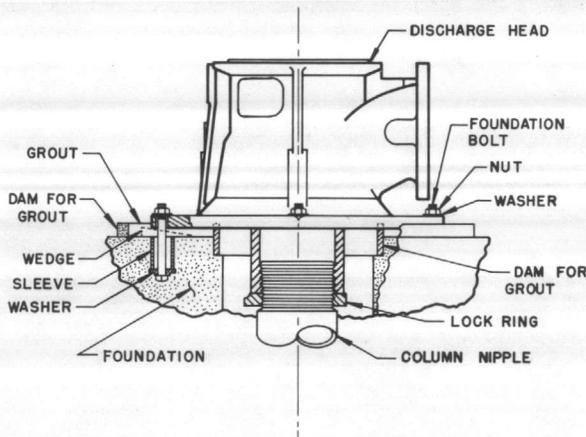


Figure 3-1 Preparing the Foundation

building members, beams or walls. Base plates shall be bolted to the supports to avoid distortion, prevent vibration, and retain proper alignment.

3-3. DEEP WELL TURBINE PUMP

Install the pump only after the well has been proven and production characteristics established, by means of a test pump. The lowest extremity of the pump must be above the perforations of the well casing, to avoid air entrainment, and excessive friction which may cause extensive pump damage.

3-4. WATER LEVEL

3-5. To establish the water level in a well proceed as follows:

A. Install a pipe or copper tube of known length, 10 to 20 feet below the lowest possible pumping level. Make all joints air tight utilizing thread compound.

B. Pump air into the line until the indicated air pressure stabilizes. This indicates that all the water has been expelled from the pipe. The gage reading indicates the pressure necessary to support a column of water of a height equal to the depth that the pipe is submerged.

$$\text{WATER LEVEL} = \text{AIR LINE LENGTH (FT.)} \\ \text{(Ft. Below Ground)}$$

$$\text{MINUS } \frac{\text{GAGE READING IN PSI} \times 2.31}{\text{SPECIFIC GRAVITY OF LIQUID}}$$

3-6. The first stage (closest to suction bowl) must be completely submerged at the minimum standing water level. With a tail pipe the minimum pumping water level may fall below the first stage, but this distance must be subtracted from the NPSH available. The NPSH available must always exceed NPSH required by the pump. The suction bowl or tail pipe must be sufficiently submerged to prevent vortexing.

SECTION 4 INSTALLING THE BOWL

4-1. BOWL INSTALLATION

4-2. Pumps that are 20 feet or less in length are usually shipped completely assembled with exception of the driver, vent piping, mechanical seal or packing, and headshaft, if a vertical hollow shaft driver is supplied.

WARNING

DO NOT WORK UNDER A HEAVY, SUSPENDED OBJECT UNLESS THERE IS A POSITIVE SUPPORT UNDER IT, WHICH WILL PROTECT PERSONNEL SHOULD A HOIST OR SLING FAIL.

4-3. Prior to installing the bowl, remove all accumulated dust, oil or other foreign matter from external surfaces of the pump components and proceed as follows:

A. Position a suitable lifting device over the well or sump opening. Place two timbers or I beams across the well or sump opening strong enough to safely support the weight of the entire pump.

NOTE

IF THE PUMP IS COMPLETELY ASSEMBLED, PROCEED TO SECTION 7.

B. If pump exceeds 200 feet measure available bowl lateral (shaft end play) by pushing shaft towards suction bowl, mark shaft, pull shaft out and mark again and record, this will later aid in adjusting impellers.

C. If provided, install tail pipe (697). Place an elevator clamp just below the tail pipe threads. Attach a sling to the clamp and to hoist hook. Hoist over the well or sump and attach strainer (698) if provided. Lower tail pipe until clamp rests firmly on the supporting timbers. (SEE FIGURES 5-1 AND 6-1).

D. Attach and secure an elevator clamp just below and firmly butted against the top intermediate bowl flange (670). Attach a sling to the clamp and pass the loop end of the sling over the hoist hook. Guide the pump suction to prevent bumping or dragging and hoist the assembly over the well or sump opening.

E. If pressure flush lines to the tail bearing are provided, attach the flush lines to suction bowl and along the length of the bowl assembly. Lubricate joints with thread compound.

F. If a tail pipe is provided, apply thread compound to the tail pipe threads and carefully thread tail pipe into bowl assembly, until joints butt.

G. If a suction strainer (698) is provided, assemble to suction bowl.

H. Lower the bowl assembly into well or sump until elevator clamp rests firmly on the supporting timbers.

J. Place a cover over bowl assembly to prevent entrance of dirt or other foreign matter. Check to see that pump shaft coupling (649) is clean.

K. If keyed shaft coupling is used, remove upper split ring and key.

CAUTION

DO NOT DROP ANY FOREIGN OBJECT INTO THE BOWL ASSEMBLY. SUCH AN OBJECT CAN CAUSE SERIOUS DAMAGE TO THE PUMP AND ANY DOWNSTREAM COMPONENTS. ANY FOREIGN OBJECT DROPPED INTO THE BOWL ASSEMBLY MUST BE RETRIEVED PRIOR TO CONTINUING ASSEMBLY.

SECTION 5 INSTALLING PRODUCT LUBRICATION COLUMN (OPEN LINESHAFT)

5-1. INSTALLING PRODUCT LUBRICATION COLUMN (SEE FIGURE 5-1).

5-2. Installation of product lubrication column, proceed as follows:

A. Check that bottom line shaft is not bent and insert into bottom column section.

B. Place an elevator clamp near top of column just below, and butted firmly against, column pipe coupling (645). For flanged columns, place the elevator clamp just below the flange.

NOTE

FOR FLANGED PIPE, TOP OF COLUMN HAS A FLANGE WITH UNTAPPED HOLES.

CAUTION

ELEVATOR CLAMP PADS MUST BE BUTTED FIRMLY AGAINST THE FLANGE, NOT AGAINST FLANGE TO COLUMN WELD, AND POSITIONED IN SUCH A MANNER AS TO ALLOW MAXIMUM INSERTION OF FLANGE BOLTS. BEFORE PROCEEDING, CHECK BY INSERTING FLANGE BOLTS THROUGH FLANGE. A MINIMUM OF ONE-HALF OF THE FLANGE BOLT HOLES MUST NOT BE OBSTRUCTED.

C. Attach a sling to elevator clamp and to hoist hook. Tie bottom of shaft (646) to column (644),

by tying a tail rope to deep throated clamp attached to the bottom of column, then tie a clove hitch or double half hitch around the shaft in the threaded area. Figure 5-2 also shows the alternate method (dotted lines).

D. For all keyed shafts, threaded shafts, and for safety, use chain wrenches (clamp type) attached to shaft just above the shaft tail rope hitch. For keyed shafts, the tail rope hitch shall be above the keyway.

E. Utilize the remaining tail rope to keep tension on the knots during hoisting. Lower end of column section shall be guided by drag line which is pulled by the hoist. A traveling block for the drag line shall be attached to a deep throated clamp, which is secured to bottom of the column.

NOTE

FOR FLANGED COLUMN, TRAVELING BLOCK SHALL BE ATTACHED TO AN EYE BOLT, THREADED THROUGH A FLANGE BOLT HOLE.

F. Hoist column section over pump, keeping tension on tail rope. With column in a vertical position, remove drag line and traveling block, lower column until bottom line shaft is properly aligned with impeller shaft coupling.

CAUTION

USE "MOLYKOTE" DOW-CORNING OR EQUAL FOR ALL GALLING MATERIALS SUCH AS 316 STAINLESS STEEL.

G. For keyed shaft, install retaining ring, and insert key onto line shaft. Lower into shaft coupling approximately one inch. Insert split ring, lower lineshaft until split ring bottoms in the groove.

H. With line shaft in proper position on coupling, remove tail rope, and start threading line shaft into coupling. Clean any dirt which may have entered the threads underneath the tail rope, and apply a few drops of oil to shaft threads if non-galling material. Thread manually until resistance is felt. Finish the joint utilizing a pair of pipe wrenches. Use care not to apply wrenches on bearing journal areas.

NOTE

SHAFT THREADS ARE LEFT HAND.

CAUTION

MAKE UP THREADED JOINTS MANUALLY TO VERIFY THAT THREADS ARE PROPERLY ENGAGED PRIOR TO APPLYING A WRENCH OR A POWER DRIVE. IF CROSS - THREADING OCCURS, BREAK THE JOINT AND REPAIR THREADS. IF THREADS ARE BEYOND REPAIR, REPLACE THE DAMAGED PART.

J. Pumps equipped with keyed coupling, secure retaining ring with capscrews.

K. Clean column threads and lubricate with thread compound.

L. Lower column section (644) until column aligns with discharge bowl threads. Manually, thread column into discharge bowl.

M. Complete joint by tightening column with chain tongs, or capstan drive, and rope until end of column butts firmly against discharge bowl (661).

N. Flanged columns-lower column section until column flange engages the flanged top bowl register. Insert as many capscrews through both flanges as possible, a minimum of one-half the total. Tighten capscrews gradually in diametrically opposite pairs.

CAUTION

DO NOT DROP ANY FOREIGN OBJECT INTO THE PUMP ASSEMBLY. SUCH AN OBJECT CAN CAUSE SERIOUS DAMAGE WHEN THE PUMP IS STARTED, AND ALSO TO DOWNSTREAM COMPONENTS. ANY FOREIGN OBJECT DROPPED INTO THE PUMP ASSEMBLY MUST BE RETRIEVED PRIOR TO CONTINUING ASSEMBLY.

P. Pump with flanged column — Lift pump assembly high enough to allow rotation of the elevator clamp one-quarter turn. Realign and lower assembly. Install and tighten remaining capscrews. Repeat rotation and tightening procedure until all the capscrews are uniformly tight.

Q. If required, attach the next section of pressure flush line and secure to column.

R. Lift the assembly and remove the elevator clamp secured to bowl assembly. Slowly lower assembly into well or sump until column elevator clamps gently come to rest on timbers, and remove sling.

S. Place bearing retainer (652) over shaft (646) and locate it in the column flange register or column coupling recess, whichever the case may be.

NOTE

POUR A SMALL AMOUNT OF OIL BETWEEN BEARING AND SHAFT OR SHAFT SLEEVE. (METAL BEARINGS ONLY).

T. REMOVABLE SHAFT SLEEVE — Slip sleeve on shaft and through bearing retainer, align sleeve hole and shaft hole, and press in roll pin.

CAUTION

DO NOT STRIKE PIN WITH A HAMMER. THIS WILL KNOCK THE SHAFT OUT OF ALIGNMENT.

NOTE

PLACE A COVER OVER COLUMN OPENING TO PREVENT ENTRANCE OF FOREIGN MATTER.

NOTE

AFTER THE FIRST COLUMN SECTION, THE SHAFT SHOULD BE SUPPORTED WITHIN THE LINE-SHAFT BEARING (653). THE SHAFT SHOULD EASILY BE PULLED TO THE CENTER OF THE BEARING. IF RESISTANCE IS FELT, WHEN MOVING THE SHAFT A BENT LINESHAFT MAY BE INDICATED. PULL PUMP AND CHECK LINESHAFT FOR STRAIGHTNESS.

U. Clean shaft (646) threads and lubricate with oil if non-galling material. Thread shaft coupling (649) on shaft until one-half of coupling threads are engaged.

V. KEYED COUPLING — Install lower half of keyrod coupling on shaft. Remove upper retaining ring, upper split rings, and key.

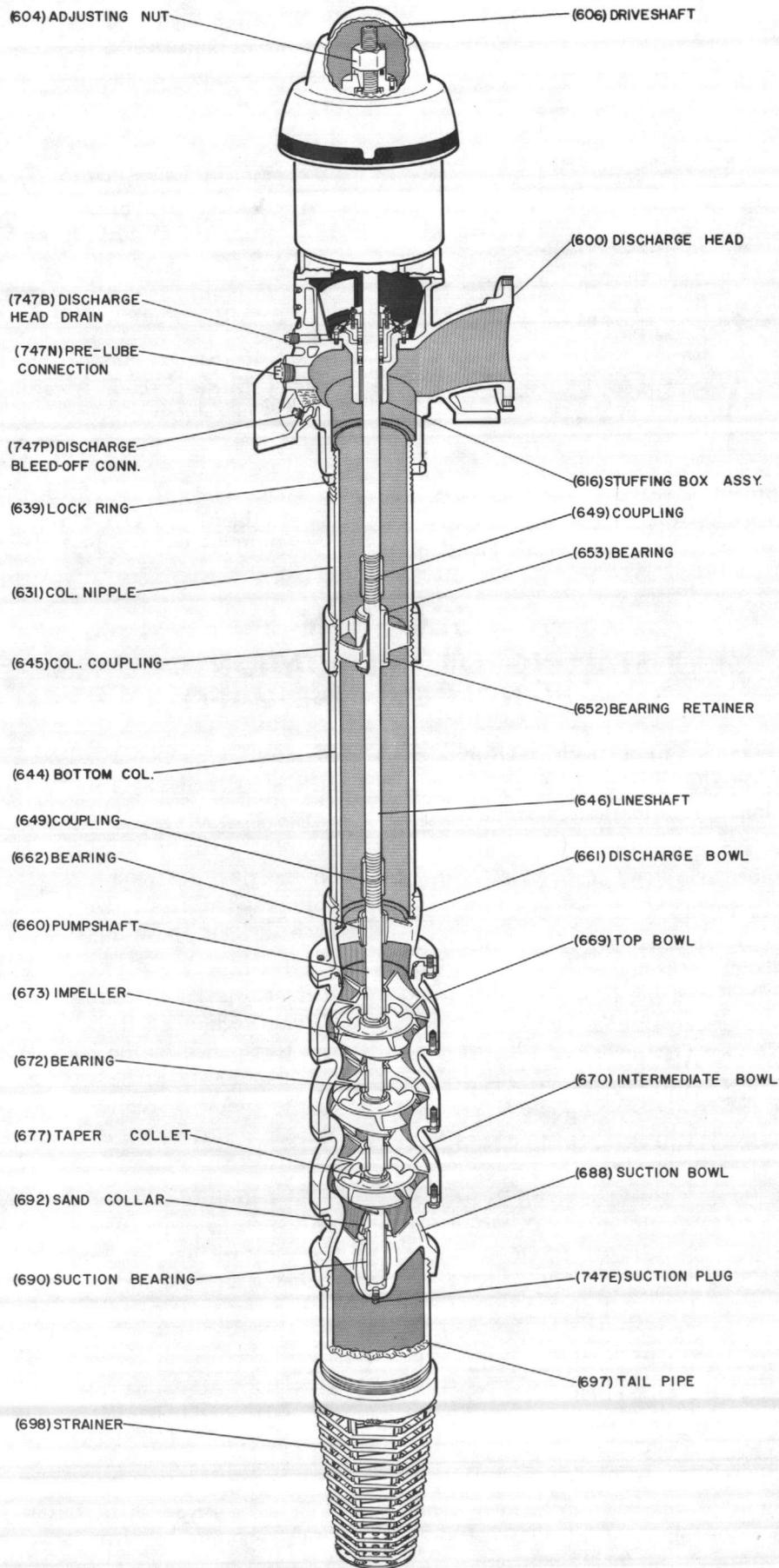


Figure 5-1 Product Lubrication Pump

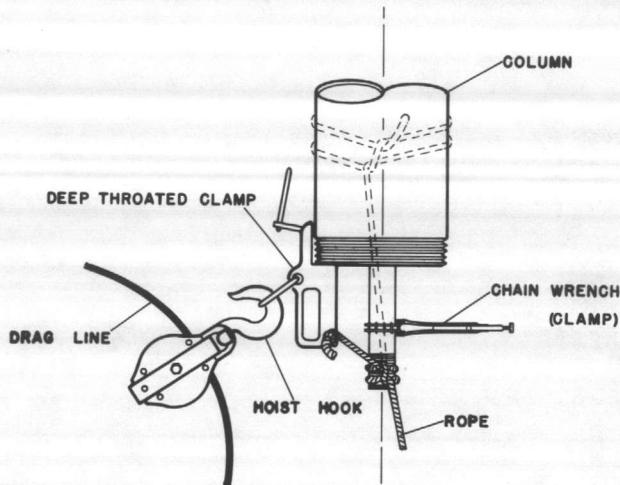


Figure 5-2 Product Lubrication Column Hoisting

W. Repeat the preceding procedures until all column sections required for the proper setting have been installed excluding the column adjusting nipple (631), if required.

NOTE

FOR FLANGED COLUMN, DO NOT OVER-TIGHTEN FLANGE BOLTS IN ORDER TO MAKE FLANGE FACES MEET. FLANGE FACES ARE DESIGNED TO BE SEPARATED BY BEARING RETAINER.

X. If required, install the column nipple with longest threaded end upward. Thread lock ring (639) on column.

CAUTION

DO NOT USE A CLAMP ON THE COLUMN ADJUSTING NIPPLE TO SUPPORT THE PUMP ASSEMBLY.

SECTION 6 INSTALLING OIL LUBRICATION COLUMN (ENCLOSED LINESHAFT)

6-1. INSTALLING OIL LUBRICATION COLUMN (SEE FIGURE 6-1).

6-2. Installation of oil lubrication column, proceed as follows:

A. Insert tube (654) and shaft (646) sections into column section.

B. Place an elevator clamp near top of column just below and butted firmly against column pipe coupling (645). For flanged columns, place the elevator clamp just below the flange.

CAUTION

ELEVATOR CLAMP PADS MUST BE BUTTED FIRMLY AGAINST THE FLANGE, NOT AGAINST FLANGE TO COLUMN WELD, AND POSITIONED IN SUCH A MANNER AS TO ALLOW INSERTION OF FLANGE BOLTS. BEFORE PROCEEDING, CHECK BY INSERTING FLANGE BOLTS THROUGH FLANGE. A MINIMUM OF ONE-HALF OF FLANGE BOLT HOLES MUST NOT BE OBSTRUCTED FOR INSERTION OF FLANGE BOLTS.

C. Attach a sling to elevator clamp and to hoist hook. Attach bottom of shaft (646) to column (644), by tying a tail rope to deep throated clamp attached to bottom of column. (SEE FIGURE 6-2). Tie a clove hitch or double half hitch around the enclosing tube and then around the shaft in thread-

ed area. Figure 6-2, also shows the alternate method (dotted lines).

D. For all keyed shafts, and for safety, on threaded shafts, use chain wrenches (clamp type) on the shaft just above the shaft tail rope hitch. (SEE FIGURE 6-2). For keyed shafts the tail rope hitch shall be above the keyway.

E. Utilize the remaining tail rope to keep tension on the knots during hoisting. Lower end of column section shall be guided by a drag line which is pulled by the hoist. A traveling block for the drag line shall be attached to a deep-throated clamp, which is secured to bottom of the column. Take care that clamp does not damage the column threads.

F. Hoist column section over pump, keeping tension on tail rope. With column in a vertical position, remove drag line and traveling block, lower column until bottom line shaft is properly aligned with pump shaft coupling.

CAUTION

USE "MOLYKOTE" DOW-CORNING OR EQUAL FOR ALL GALLING MATERIALS SUCH AS 316 STAINLESS STEEL.

G. For keyed shaft, install retaining ring and insert key onto line shaft, lower into shaft coupling approximately one inch. Insert split ring, lower line-shaft until split ring bottoms in the groove.

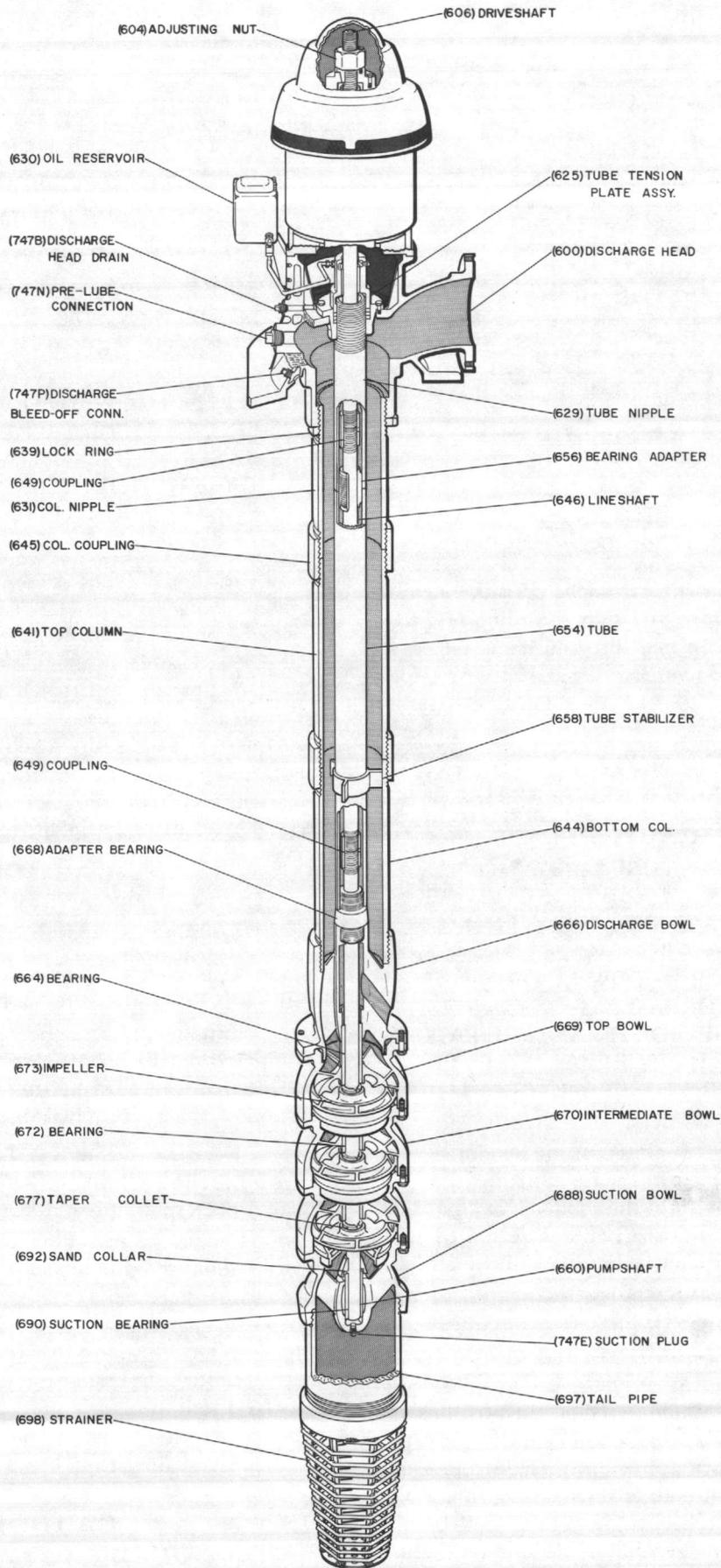


Figure 6-1 Enclosed Lineshaft Pump

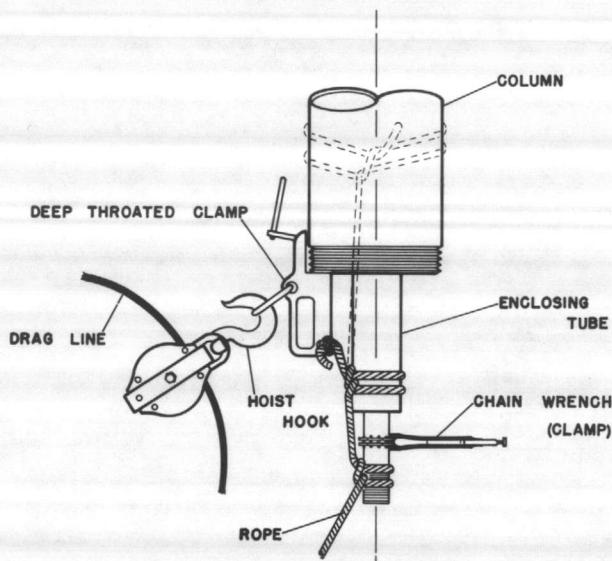


Figure 6-2 Oil lubrication Column Hoisting

H. With line shaft in proper position on coupling, remove tail rope and start threading line shaft into coupling. Clean any dirt which may have entered the threads underneath the tail rope and apply a few drops of oil to shaft threads (If non-galling material).

NOTE

SHAFT THREADS ARE LEFT HAND.

CAUTION

MAKE UP THREADED JOINTS MANUALLY TO VERIFY THAT THREADS ARE PROPERLY ENGAGED PRIOR TO APPLYING A WRENCH OR A POWER DRIVE. IF CROSS - THREADING OCCURS, BREAK THE JOINT AND REPAIR THREADS. IF THREADS ARE BEYOND REPAIR, REPLACE THE DAMAGED PART.

Thread shaft into coupling, manually until resistance is felt. Complete the joint utilizing a pair of pipe wrenches, butting the bottom of the shaft against the top of the shaft. Use care not to apply wrenches on bearing journal areas. Remove all burrs and chips with a clean cloth.

J. Pumps equipped with keyed coupling, secure retaining ring with capscrews.

K. Carefully lower column section until lower end of the tube section rests on adapter bushing (668). Remove tail rope, clean outside of adapter bushing and lubricate with thread compound. Thread tube section onto adapter bushing manually, until resistance is felt. Complete tube joint by utilizing a pair of pipe wrenches or chain tongs, butting the end of the tube against the upper end of the tube adapter bushing.

L. Clean column threads and lubricate with thread compound.

M. Lower column until column aligns with discharge bowl. Manually thread column into discharge bowl. Complete joint by tightening column, utilizing chain tongs or capstan drive and rope until end of column butts firmly against discharge bowl.

CAUTION

MAKE UP THREADED JOINTS MANUALLY TO VERIFY THAT THREADS ARE PROPERLY ENGAGED PRIOR TO APPLYING A WRENCH OR A POWER DRIVE. IF CROSS - THREADING OCCURS, BREAK THE JOINT AND REPAIR THREADS, IF THREADS ARE BEYOND REPAIR REPLACE THE DAMAGED PART.

N. Flanged columns — lower section until column flange engages the flanged discharge bowl register. Insert as many capscrews through both flanges as possible a minimum of one-half the total. Tighten capscrews gradually in diametrically opposite pairs. Lift pump assembly, rotate elevator clamp one-quarter turn, realign and lower assembly. Install, and tighten the remaining capscrews. Repeat rotation and tightening procedure until all capscrews are uniformly tight.

CAUTION

DO NOT DROP ANY FOREIGN OBJECT INTO THE PUMP ASSEMBLY.

P. If provided, attach the next section of pressure flush line and secure to the column.

Q. Lift pump assembly and remove elevator clamp secured to bowl assembly. Slowly lower assembly into well or sump until elevator clamp gently comes to rest on timbers and remove the sling.

R. Keyed coupling — Install lower half of keyed coupling on shaft. Remove upper retaining plate, upper split ring and key.

S. Repeat the preceding procedures. At equally spaced intervals throughout the column assembly, install tube stabilizer (658) over the enclosing tube (654), using soapy water as lubricant. Continue until all column sections for the proper setting have been installed, excluding the column adjusting nipple (631), if provided. If pump is equipped with column adjusting nipple, install it with longest threaded end upward. Thread lock ring (639) on column.

CAUTION

DO NOT USE A CLAMP ON THE COLUMN ADJUSTING NIPPLE TO SUPPORT PUMP ASSEMBLY.

SECTION 7

INSTALLING THE DISCHARGE HEAD

7-1. INSTALLING A COMPLETELY ASSEMBLED PUMP

7-2. For pumps shipped from the factory assembled with driver, suction bearing pressure flush line, suction strainer, and/or tail pipe, remove these components prior to installing the pump assembly.

A. Attach a sling to the discharge head and hoist the pump assembly over the well. Carefully guide the pump to avoid dragging or bumping the suction end.

B. If applicable, reassemble suction bearing lube line, tail pipe and/or suction strainer. Refer to SECTION 4.

C. Continue assembly procedure with paragraph 7-4 step H.

7-3. INSTALLING THE DISCHARGE HEAD

7-4. If a subbase is provided, remove any burrs and clean thoroughly. Install the discharge head on the subbase and secure it with capscrews provided.

A. If the stuffing box (SEE FIGURE 8-1) or oil tube tension nut (SEE FIGURE 9-1), is assembled to the head, remove these components at this time.

B. Thread two eyebolts in the head driver mounting holes diametrically opposite. Attach a sling to eyebolts and hoist discharge head over the pump.

CAUTION

DO NOT LIFT HEAD BY LIFTING LUGS IF PUMP IS NOT ATTACHED. THE HEAD IS HEAVIER ON THE DISCHARGE SIDE AND WILL TIP.

C. Clean the threads at upper end of column assembly and lubricate with thread compound.

CAUTION

DO NOT BUMP OR SCRAPE THE SHAFT PROTRUDING ABOVE THE COLUMN. THIS COULD RESULT IN BENDING OR DAMAGING THE SHAFT.

D. Slowly lower the discharge head, aligning the vertical hole in the center with the shaft protruding above the column. Continue to lower the discharge head (600), until the large threaded hole in the bottom of discharge head rests squarely on top of column. Rotate discharge head, threading onto column, butting the top of column tightly against the discharge head. (SEE FIGURE 6-1).

E. If pump has a column nipple (631) with product lube, screw the discharge head onto the column nipple until the head shaft (608) extends above the top of pump base, about one inch plus adjusting nut thickness, and the distance through the motor or gearhead drive, often referred to as the C.D. Dimension. For oil lube (enclosed line shaft), the tube nipple (631) should be approximately $\frac{3}{4}$ " above the surface where the tube tension plate (625) mates with the head (600).

F. If a pressure flush line is being installed, terminate above the discharge head base.

G. Hoist the discharge head by lifting lugs, and remove elevator clamp attached to column.

H. Remove the supporting timbers or I beams and clean the top of foundation area. Orient the discharge head in the required position. Lower the pump, until the base of the discharge head engages the foundation bolts. If a concrete foundation is used place leveling wedges near the foundation bolts. In case of a structural foundation or pump which will not be grouted to the foundation use shims for leveling the pump.

J. Continue to lower the pump until base of discharge head or subbase rests firmly on the wedges or shims.

K. Check the levelness of the discharge head in all directions, utilizing a spirit level across the driver mounting surface of the discharge head. The discharge head must be level with all wedges or shims butting tightly against the base of discharge head and against the foundation. Install nuts on foundation bolts, tighten them gradually and uniformly. Check to see that pump has remained level in all directions after final tightening.

SECTION 8

STUFFING BOX INSTALLATION (PRODUCT LUBRICATION)

8-1. STUFFING BOX INSTALLATION

A. If provided install headshaft sleeve and press pin into shaft.

NOTE

DO NOT STRIKE PIN WITH A HAMMER, THIS WILL BEND SHAFT OR KNOCK IT OUT OF ALIGNMENT.

8-2. FOR STYLE "A"

A. Position gasket (779A) on discharge head. Slide stuffing box (616) down over the headshaft (608) into position on the gasket. Secure with capscrews (758B).

B. Insert lantern rings (621), and packing rings (620A) as shown in figure 8-1. Install packing rings 180° apart, for each successive packing ring installed.

C. Install split gland (618), and insert studs (739A) through split gland and into stuffing box. Install nuts (735A) finger tight. Install grease line or pipe plug (747G) in grease port, and bypass line (624) in bypass port.

NOTE

GREASE PORT IS DESIGNATED AS PORT "A" AND BYPASS AS PORT "B" STAMPED ON STUFFING BOX.

CAUTION

DO NOT OVER-TIGHTEN STUFFING BOX. IT CAN WEAR OUT PACKING PREMATURELY AND SERIOUSLY DAMAGE THE SHAFT.

8-3. FOR STYLE "B"

A. Same as for style "A".

B. Insert packing washer (789C) and packing (620A) as shown in figure 8-1.

C. Install split gland (618) and insert studs (739A) through split gland and into stuffing box. Install nuts (735B) finger tight. Install bypass line in bypass port (624).

NOTE

GREASE LINE MAY BE INSTALLED AS AN OPTION TO BYPASS LINE IF DISCHARGE PRESSURE IS LESS THAN 100 PSI.

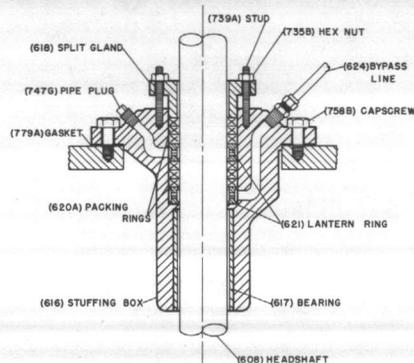
8-4. FOR STYLE "C"

A. Same as for style "A".

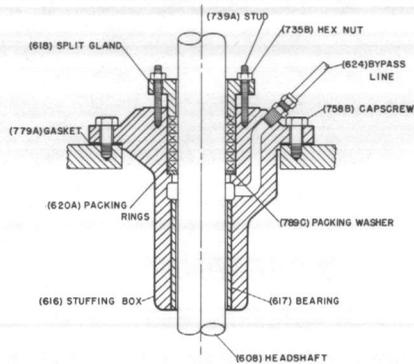
B. Install packing rings (620A).

C. Install split gland (618) and insert studs (739A) through split gland and into stuffing box. Install nuts (735A) finger tight.

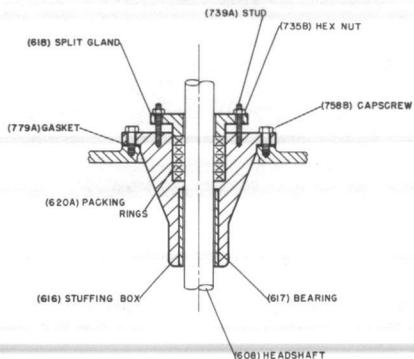
8-5. Instructions for installing the mechanical seal are provided by the manufacturer of the seal. These instructions must be carefully followed to prevent leakage or premature wear of the seal or the pump shaft.



Style A



Style B



Style C

Figure 8-1 Stuffing Box

SECTION 9

INSTALLING TUBE TENSION PLATE ASSEMBLY AND LUBRICATION SYSTEM (OIL LUBRICATION)

9-1. INSTALLING THE TUBE TENSION NUT

A. Lubricate tube threads and underside of tension plate flange with thread compound. Thread the tension plate (625) onto the enclosing tube nipple (629) manually until its shoulder rests on the discharge head. (SEE FIGURE 9-1).

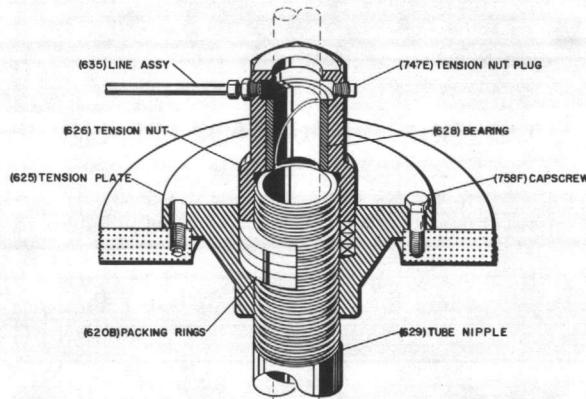


Figure 9-1 Tension Plate Assy (Drip Feed Lubrication)

9-2. TENSIONING THE ENCLOSING TUBE

A. The enclosing tube sags from its own weight as it is installed, and must be pulled tight (tensioned) to make it straight. This section describes two methods of tensioning the tube. The direct pull method is more precise and is preferred. The second method — the wrenching method — is given as an alternate.

NOTE

THE CORRECT TENSION IS EQUAL TO THE WEIGHT OF THE ENCLOSING TUBE PLUS 10%.

B. Weights per foot for each tube size are given in Table 9-1. Multiply by total length of the tube to determine the total weight.

9-3. DIRECT PULL METHOD

A. The upper end of the tube may be pulled by the hoist to obtain the pre-determined tension value. This requires the use of a dynamometer scale and an adapter fitting to grip the tube. (TUBE TENSION ADAPTER AVAILABLE THROUGH FACTORY). With the tension plate installed manually but not tightened, thread the special fitting onto the top of the tube to full engagement. Attach the dynamometer scale to the fitting, and connect the upper end of the scale to the hoist hook. Operate the hoist hook to apply the required tension.

This shall pull the tension plate off the discharge head. Manually thread the tension plate to reset it. Release tension, remove dynamometer scale and special fitting.

TABLE 9-1
WEIGHT-PER-FOOT OF ENCLOSING TUBE

TUBE SIZE (INCH)	WEIGHT PER FOOT (LB.)
1¼	2.99
1½	3.63
2	5.02
2½	7.66
3	10.25
3½	12.50
4	14.98
5	20.78
6	28.57

9-4. WRENCHING METHOD

A. If a dynamometer scale is not available, the tube can be tensioned by wrenching the tube nut. Torque the tension plate to take all slack out of the tube, and induce a reasonable amount of tension by turning tension plate counterclockwise.

NOTE

DO NOT TURN CLOCKWISE TO ALIGN HOLES IN TENSION PLATE AND DISCHARGE HEAD.

9-5. DIRECT PULL AND WRENCHING METHOD

A. Install capscrews (758F) in the tension plate. Pour one pint of oil down the oil tube.

B. Install packing in the tension plate and thread the tension nut (626), tightening it firmly against the packing.

C. If a packed type tension nut (623) is used, install packing (620C), packing gland (618) and secure with stud (739E) and nut (735B). Screw nut finger tight. Install line assembly (635) and connect to flush liquid supply. (SEE FIGURE 9-2).

CAUTION

BE SURE THAT THE TOP OF THE ENCLOSING TUBE DOES NOT INTERFERE WITH THE TENSION NUT.

D. If top of the tube interferes with the tension nut determine the distance, if tube is too long or too short. Remove tension plate, raise pump assembly, unthread lock ring (639), and adjust nipple (631) (SEE FIGURE 6-1) the required distance to eliminate interference. Reinstall and re-level pump. Refer to SECTION 7 paragraphs J and K.

9-6. LUBRICATION SYSTEM

A. Connect solenoid valve (IF PROVIDED), oil lines, and fill the oil reservoir with oil. Refer to SECTION 18.

B. Check the lubricator feed and see that the oil reservoir is flowing freely. (In the case of a solenoid valve, temporary power connections are required). Set the proper drops per minute on the regulator. Table 9-2 shows recommended regulator setting.

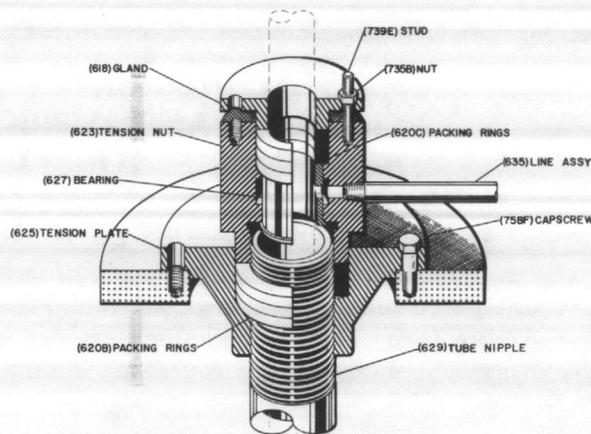


Figure 9-2 Tension Plate Assy (Flush Lubrication)

TABLE 9-2 REGULATOR SETTING

DROPS PER MINUTE PER 100 FEET OF SETTING	SHAFT SIZE (INCH)
8	3/4 to 1
16	1 3/16 to 1 15/16
20	2 3/16 and larger

SECTION 10 INSTALLING THE DRIVER (VHS)

10-1. INSTALLATION OF HOLLOW SHAFT DRIVER

WARNING

DO NOT WORK UNDER A HEAVY SUSPENDED OBJECT UNLESS THERE IS A POSITIVE SUPPORT UNDER IT WHICH WILL PROTECT PERSONNEL SHOULD A HOIST OR SLING FAIL.

10-2. DRIVER SUPPORT. If a driver support is furnished proceed as follows:

A. Hoist driver support and inspect mounting surfaces and register and clean these surfaces thoroughly.

B. Install driver support on discharge head and secure with capscrews.

CAUTION

USE "MOLYKOTE" DOW-CORNING OR EQUAL FOR ALL GALLING MATERIALS SUCH AS 316 STAINLESS STEEL.

10-3. COMBINATION DRIVESHAFT. In the case of a pump having a combination driveshaft (shaft extends above the motor mounting flange) proceed as follows:

A. Remove driver cover and drive coupling. (SEE FIGURE 10-1).

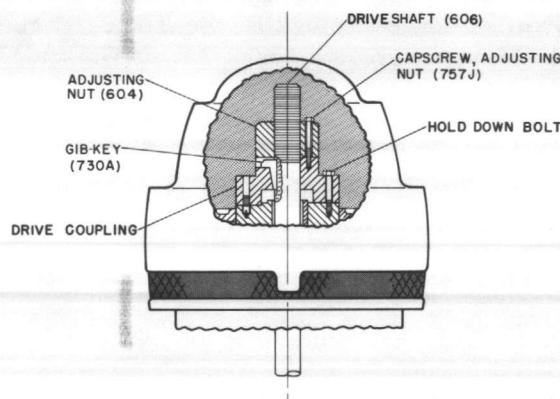


Figure 10-1 Hollow Shaft Adjusting Nut

B. Attach a sling to the lifting lugs on driver. Hoist driver, inspect the mounting surfaces and register, and clean these surfaces thoroughly. If any burrs are found, remove burrs with a smooth mill file.

C. Lower driver slowly, aligning the driver hollow shaft with the combination driveshaft, and onto the discharge head or driver support being extreme-

ly careful that combination driveshaft does not bind in the driver hollow shaft. Orient the driver conduit box in the required position and align the mounting holes with the mating tapped holes in the discharge head or driver support.

D. Secure driver to discharge head or driver support with capscrews provided.

E. Check that the pump shaft is concentric with the hollow shaft of driver by sliding the driver coupling over the combination headshaft. If the driver coupling freely engages the drive pins at the top of the driver, the pump headshaft is properly concentric. Eccentricity at this point may be to a bent shaft or to foreign particles between butting ends of shaft sections. The cause must be found and corrected before proceeding. Remove driver coupling.

10-4. SEPARATE HEADSHAFT AND DRIVESHAFT. In the case of a pump having a separate headshaft and driveshaft (headshaft terminates below the driver mounting flange) proceed as follows:

A. Slowly lower the driver onto driver mounting flange, orient the driver conduit box in the required position and align the mounting holes with the mating tapped holes in the discharge head.

B. Apply a thin film of oil to headshaft threads (if non-galling material), install coupling to headshaft utilizing a strap wrench below the coupling.

CAUTION

DO NOT DAMAGE HEADSHAFT OR COMBINATION HEADSHAFT. ANY BURRS RAISED ON SHAFTING SHALL MAKE IT DIFFICULT TO REMOVE SEAL, SLEEVE, OR STUFFING BOX.

C. Slide the driveshaft (606) downward through the hollow shaft of the driver to meet the headshaft coupling. Apply a thin film of oil to the shaft threads (if non-galling material) and screw into coupling. Make sure the shaft is not damaged in any way.

10-5. ALL PUMPS. The following information applies to all pumps.

A. On drivers having non-reverse ratchet, manually turn the driver shaft clockwise until the non-reverse ratchet fully engages.

B. Lubricate the driver bearings in accordance with the instructions given on the lubrication plate attached to the driver case.

WARNING

THE MOTOR MUST NOT BE TESTED FOR DIRECTION OF ROTATION WHEN COUPLED TO THE PUMP. IF PUMP SHOULD ROTATE IN THE

WRONG DIRECTION, SERIOUS DAMAGE TO THE PUMP AND DRIVER AND SERIOUS INJURY TO NEARBY PERSONNEL COULD RESULT.

C. Make temporary electrical connections according to tagged leads or diagram attached to the driver. The driver must rotate counterclockwise when viewed from above. See arrow on pump name plate. If driver does not rotate counterclockwise, change driver rotation by interchanging any two leads, for three phase only. For single phase, see driver manufacturer's instructions.

D. Slip on driver coupling (SEE FIGURE 10-1). Apply a thin film of oil on gib key (730A) and install key. Key shall be a slide fit allowing adjustment of the drive shaft by means of the adjusting nut. Secure drive coupling, see that the drive coupling is properly seated. Install adjusting nut (604), but do not adjust impellers at this time.

10-6. PRELIMINARY ADJUSTMENTS OF IMPELLERS. Mechanical seals if used must be disengaged before impeller adjustment.

10-7. Pumps with setting over 200 feet, continue with paragraph 10-8.

A. With impellers touching bowl faces, turn adjusting nut (604) counterclockwise until face of the nut makes contact with motor coupling.

B. Align hole "A" in adjusting nut and hole "C" in motor coupling. (SEE FIGURE 10-2).

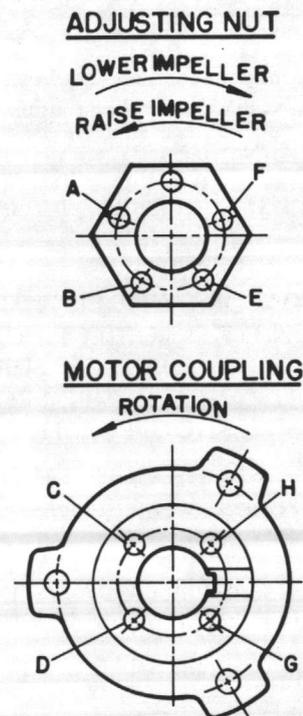


Figure 10-2 Impeller Adjustment

C. Insert capscrew in hole "B". Turn adjusting nut counterclockwise until holes "B" and "D" line up. This gives minimum adjustment 1/20 of one turn — (SEE TABLE 10-1 for vertical movement).

D. By turning adjusting nut still more and aligning holes "E" and "G" impellers are raised 2/20 turn. When holes "F" and "H" align, impellers are raised 3/20 turn and so on. SEE TABLE 10-1.

E. For open impellers, turn adjusting nut 3/20 turn for pumps up to 10 feet of column. Add 2/20 turn for each additional 10 feet of column.

F. For enclosed impellers, use two turns for the first 100 feet and one turn for each additional 50 feet of setting.

10-8. For pump settings over 200 feet adjustment procedures are as follows:

A. Turn adjusting nut counterclockwise until impellers reach the top of bowl (resistance is felt when impellers rub against the top of bowl). Lower impellers 30% of distance acquired in Section 4 paragraph 4-3 step B. SEE TABLE 10-1.

10-9. GROUTING THE BASE. If the pump is on a concrete foundation, it is recommended that

the discharge head base be grouted to the foundation. If desired, this may be delayed until the pump installation has been tested. (SEE FIGURE 3-1). Pour the grout into the foundation and force it between the discharge head and the dammed-in area. Allow ample time for the grout to cure before starting the pump.

NOTE

USE ONLY NON-SHRINKING GROUTING MATERIAL.

**TABLE 10-1
IMPELLER VERTICAL MOVEMENT**

SHAFT SIZE	THREAD	VERTICAL MOVEMENT IN 1/20 TH TURN
3/4 INCH	3/4-16 LH	.003
1	1-12 LH	.004
1 3/16	1-12 LH	.004
1 1/2	1-10 LH	.005
1 11/16	1-10 LH	.005
1 15/16	1-10 LH	.005
2 3/16	1-10 LH	.005
2 7/16	1-10 LH	.005
2 11/16	1-8 LH	.006

**SECTION 11
INSTALLING THE DRIVER
(VSS)**

11-1. INSTALLATION OF SOLID SHAFT DRIVER

11-2. The coupling shown between the driver shaft and pump shaft may be a non-spacer figure 11-1 type or a spacer type figure 11-2. The latter is used on pumps having a mechanical shaft seal, to permit replacing the seal without lifting the driver.

WARNING

DO NOT WORK UNDER A HEAVY SUSPENDED OBJECT UNLESS THERE IS A POSITIVE SUPPORT UNDER IT, WHICH WILL PROTECT PERSONNEL SHOULD A HOIST OR SLING FAIL.

11-3. In the case of a pump having a solid shaft driver proceed as follows:

A. Apply a thin film of oil on headshaft key (730C) and insert key into headshaft keyseat.

B. Gently lower pump hub (614) over headshaft.

C. Install adjusting plate (613) on headshaft.

D. If a driver support is furnished, inspect registers and install on the discharge head, securing it with capscrews.

E. Attach a sling to the lifting lugs of driver. Hoist driver, inspect the mounting surface, the register, and shaft extension, and clean these surfaces thoroughly. If any burrs are found, remove burrs with a smooth mill file, cleaning thoroughly afterward.

F. Apply a thin film of oil to driver key (730B) and insert it into the driver shaft keyseat. Place the driver hub (610) over the driver shaft and key, sliding it up the shaft until the groove near the end of shaft is exposed. Install split ring (722) in the groove, and slide the driver hub down over the split ring to capture it.

G. Orient the driver conduit box in the required position, and align the mounting holes with the mating tapped holes in the driver support. Lower the driver until the registers engage and driver rests firmly on the driver support. Secure driver with capscrews provided.

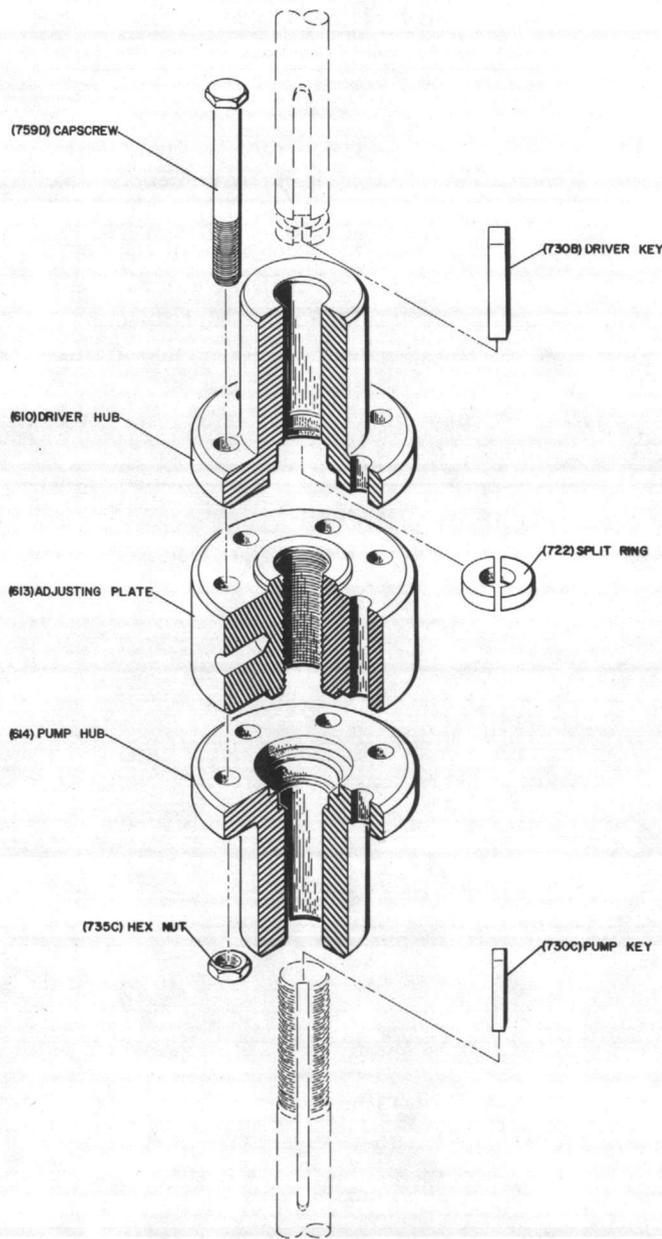


Figure 11-1 Flanged Adjustable Coupling

H. Lubricate driver bearings in accordance with instructions given on the lubrication plate attached to the driver case.

WARNING

THE MOTOR MUST NOT BE TESTED FOR DIRECTION OF ROTATION WHEN COUPLED TO THE PUMP. IF PUMP SHOULD ROTATE IN THE WRONG DIRECTION, SERIOUS DAMAGE TO THE PUMP AND DRIVER AND SERIOUS INJURY TO NEARBY PERSONNEL COULD RESULT.

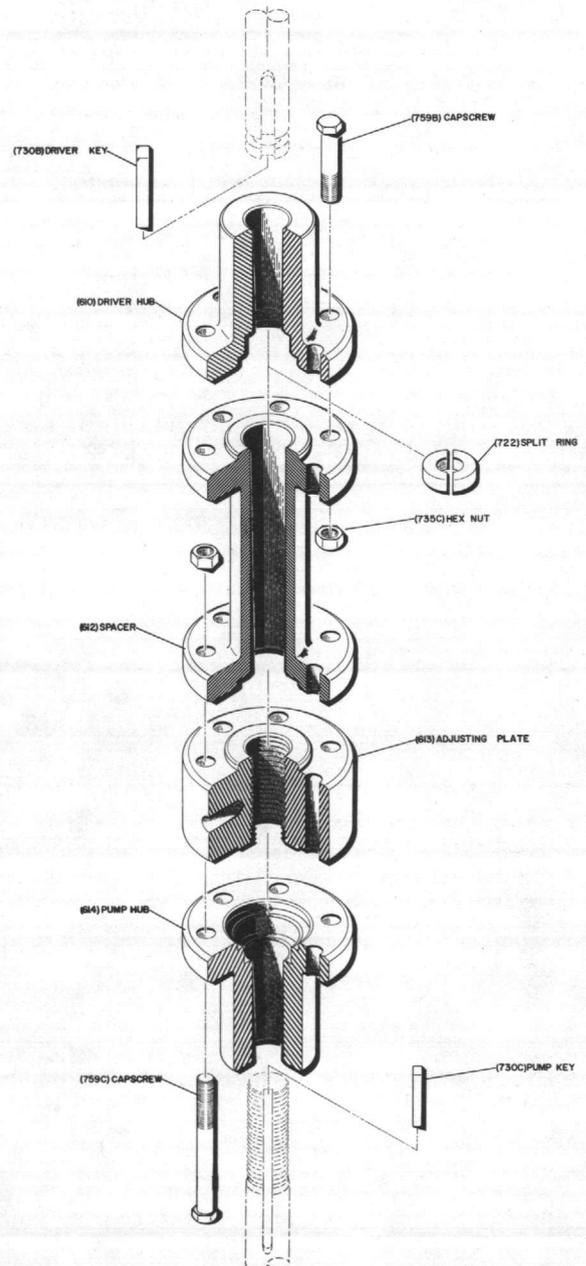


Figure 11-2 Flanged Adjustable Coupling with Spacer

J. Make temporary electrical connections according to tagged leads or diagram attached to the driver. Driver must rotate counterclockwise when viewed from above. See arrow on pump name plate. If driver does not rotate counterclockwise, change driver rotation by interchanging any two leads, for three phase only. For single phase see driver manufacturer's instructions.

K. On drivers having a non-reverse ratchet, manually turn the driver shaft clockwise until the non-reverse ratchet fully engages.

11-4. PRELIMINARY ADJUSTMENTS OF IMPELLERS. Pumps with settings less than 200 feet proceed as follows:

A. For enclosed impellers raise adjusting plate (613) toward driver hub (610) or spacer hub (612). Obtain 3/16 inch clearance between adjusting plate, and driver hub or spacer hub 1/4 inch if setting exceeds 100 feet but less than 200 feet.

B. Align adjusting plate holes with pump hub (614) holes, insert capscrews (759D), and draw pump hub to mate with driver hub or spacer hub. Tighten capscrews gradually and uniformly.

C. For open impellers procedure is the same as for enclosed impellers with following exception:

D. Obtain .015 inch clearance between adjusting plate and motor hub or spacer hub, for the first 10 feet of column. Add 0.010 for each additional 10 feet of column.

11-5. For pump settings over 200 feet procedure is the same as in paragraph 11-4 with following exception:

A. Use adjusting plate and capscrews for raising or lowering impellers instead of the adjusting nut of a hollow shaft driver.

11-6. GROUTING THE BASE. If the pump is on a concrete foundation, it is recommended that the discharge head base be grouted to the foundation. If desired, this may be delayed until the pump installation has been tested. (SEE FIGURE 3-1). Pour the grout into the foundation and force it between the discharge head and the dammed-in area. Level off the grout flush with the top of the dam. Allow ample time for the grout to cure before starting the pump.

NOTE

USE ONLY NON-SHRINKING GROUTING MATERIAL.

SECTION 12 INSTALLING THE GEARHEAD

12-1. GEARHEAD DRIVE INSTALLATION

12-2. Installation procedures for gearhead drives are similar to those for electric drivers except as follows:

A. Slowly lower the gearhead and orient with the input shaft. Align mounting holes with the mating tapped holes in the discharge head. Lower the gearhead until the registers engage and the gearhead rests firmly on the discharge head. Install capscrews in the mounting holes and tighten them gradually and uniformly.

B. Some gearheads are equipped with an oil cooling system which is supplied with cooling fluid from the pump or from external source. Make cooling connections with tubing or rubber hose.

CAUTION

DO NOT USE RIGID PIPE FOR THIS PURPOSE. RIGID PIPE IS SUSCEPTIBLE TO LEAKING AT THE JOINTS, DUE TO VIBRATION.

If pump fluid is to be used, connect a length of tubing and a flow-regulating valve between the inlet on the gearhead and a pipe tap hole in the discharge head. Attach another tube or a rubber hose to the outlet on the gearhead. This may be used to conduct the fluid back to the sump or to any convenient drain.

C. Assemble the flexible shaft flanges on gearhead drive and engine. The prime mover (engine or steam turbine) must be mounted on a firm founda-

tion in alignment with the gearhead. The flexible shafts shall be within two degrees parallel. Keep the lugs on flange yokes in same position as shipped from the factory. If slip joint is moved, be sure lugs are realigned. If a flexible coupling is used, the pump and prime mover should be installed on the same foundation. Consult the prime mover and coupling or drive shaft manufacturer's instructions for detailed information.

WARNING

MOVING PARTS OF THE PRIME MOVER, COUPLING DEVICE, AND GEARHEAD MUST BE COVERED WITH A SUITABLE RIGID GUARD IN COMPLIANCE WITH LOCAL REGULATIONS TO PREVENT INJURY TO PERSONNEL.

12-3. GROUTING THE BASE. If the pump is on a concrete foundation, it is recommended that the discharge head base be grouted to the foundation. If desired, this may be delayed until the pump installation has been tested. (See Figure 3-1). Pour the grout into the foundation and force it between the discharge head and the dammed-in area. Level off the grout flush with the top of the dam. Allow ample time for the grout to cure before starting the pump.

NOTE

USE ONLY NON-SHRINKING GROUTING MATERIAL.

SECTION 13

STARTUP AND FINAL IMPELLER ADJUSTMENT

13-1. PRE-START PROCEDURE. Before starting the pump check the following:

A. ALL PUMPS

1. Wiring of driver (IF APPLICABLE).
2. Driver must rotate counterclockwise when viewed from above.
3. Pressure flush system (IF APPLICABLE).
4. Lubrication to suction bowl (IF APPLICABLE).
5. Lubrication of driver.

B. OPEN LINE SHAFT PUMPS

1. Pumps exceeding 50 feet of setting pre-lubrication is necessary. (SEE SECTION 14, paragraph B).
2. All bearings are lubricated.
3. Grease to stuffing box (IF APPLICABLE).
4. Stuffing box bleed line connected (IF APPLICABLE).
5. All piping and gages.

C. ENCLOSED LINE SHAFT PUMPS

1. Oil lubrication piping connected (IF APPLICABLE).
2. Drip rate.

D. For most pumps, valve must be open. Some pumps can be started against a closed valve but only when designated for this application. Start the flow of lubricating fluid prior to starting the pump. Open line shaft pumps are self-lubricating and except for pumps longer than 50 feet require no external lubrication for the lineshaft bearings. Pumps longer than 50 feet require prelubrication before starting.

13-2. PUMP STARTUP

13-3. Multiply the setting by 0.1 to find the approximate number of seconds for fluid to reach discharge. Start the pump. **IF PUMP DOES NOT DISCHARGE FLUID WITHIN 2 TIMES THE ESTIMATED TIME — SHUT OFF THE PUMP.** Determine the cause and correct the problem before restarting. (SEE SECTION 15). Also, if **DRIVER OVERHEATS OR THERE IS EXCESSIVE VIBRATION STOP THE PUMP,** and correct the problem before restarting. (SEE SECTION 15).

13-4. On oil lube pumps in which the enclosing tube was tensioned by wrenching the tension tube nut, check for excessive leakage. If excessive leakage occurs, tube nut must be tightened.

13-5. With product lube pump in operation, there shall be some leakage at the stuffing box packing. The correct leakage is a rate which keeps the shaft and stuffing box cool (approximately 4 ounces per minute). Refer to SECTION 14 for packing adjustment.

13-6. FINAL ADJUSTMENT OF IMPELLERS

13-7. Final adjustment of impellers using an ammeter, proceed as follows:

A. ENCLOSED IMPELLERS

1. Connect ammeter to driver leads, start pump and record ammeter reading. Reading should be taken at maximum anticipated operating discharge head.

2. Stop pump and lower adjusting nut one-quarter turn. Start pump and record ammeter reading. Continue procedure until reading increases indicating that impeller is dragging on the bowl. Stop the pump and raise the adjusting nut one turn, impeller should clear the bowl. Start the pump and check ammeter. Ammeter should return to previous low reading. Impeller adjustment is complete.

B. OPEN IMPELLERS

1. Connect ammeter to driver leads, start pump and record ammeter reading. Reading should be taken at maximum anticipated operating discharge head.

2. Stop pump and lower adjusting nut one-quarter turn. Start pump and record reading. Ammeter reading should increase slightly. Continue procedure until reading increases sharply indicating that the impeller is dragging on the bowl. Stop the pump and raise the adjusting nut one-half turn. Impeller adjustment is complete.

13-8. Final impeller adjustment without ammeter: Lower adjusting nut until impeller bottoms on bowl. Repeat preliminary adjusting procedure outlined in SECTION 10 OR SECTION 11. This procedure is necessary as lateral often changes after first startup.

SECTION 14 MAINTENANCE

TABLE 14-1 PREVENTIVE MAINTENANCE PROCEDURES

PROCEDURE	TIME INTERVAL (HOURS)
Clean dirt, oil and grease from the driver and discharge head.	As required.
Driver ventilation passages shall be cleaned to prevent overheating.	As required.
Check oil level in reservoir. It should never be less than one-quarter full. Refill, check drip rate. See Table 9-2 for correct drip rate.	24
Pumps utilizing a high pressure flush system, the pressure shall be 10 psi higher than maximum, pump discharge pressure plus 2% of the maximum discharge pressure.	Periodically
Pumps equipped with a lubrication line to conduct grease, oil, or other fluid to tail bearing, replenish supply through lubrication fitting, usually located at the base of the discharge head.	100
Check the level in sight gage, for oil-drip lubrication.	Periodically
Open line shaft pumps. check stuffing box for correct leakage. see SECTION 14-4. If packing is supplied with grease add through filter on side of packing container.	100

14-1. PREVENTIVE MAINTENANCE

14-2. Preventive maintenance includes periodic inspection, adjustments, lubrication and tightening procedures presented in Table 14-1. Systematic inspection of the pump shall be made at regular intervals. The frequency required depends upon the operating conditions of the pump and its environment.

14-3. PACKING ADJUSTMENT AND REPLACEMENT

14-4. Pumps equipped with adjustable packing at top of shaft, shall be adjusted whenever the leakage rate exceeds 8 ounces per minute. Adjust the stuffing box as follows:

A. With the pump in operation, tighten the split gland nuts one-quarter turn for each adjustment. Allow packing to equalize against the increased pressure and leakage to gradually decrease to a steady rate, before making another adjustment.

CAUTION

DO NOT OVER-TIGHTEN THE STUFFING BOX. EXCESSIVE PRESSURE CAN WEAR OUT PACKING PREMATURELY AND SERIOUSLY DAMAGE THE SHAFT.

B. With the pump shut down and when packing has been compressed to the point that the split gland is about to contact the upper face of stuffing box, remove split gland, add one extra packing ring, and re-adjust. If this fails to reduce leakage to

4 ounces per minute remove all packing rings and replace with new rings.

C. If the replacement packing is in the form of a continuous coil or rope, it must be cut into rings before installing. Tightly wrap one end of the packing material around the top shaft like one coil of a coil spring, and mark the coil with a sharp knife. Rings must have a gap of 1/16 to 1/8 inch and the ends must be parallel. For repacking sequence refer to Section 8.

14-5. SEASONAL SHUTDOWN PROCEDURES

WARNING

MANUALLY ROTATE SHAFT SEVERAL TIMES PRIOR TO RESTARTING PUMP, WHICH HAS BEEN SHUT DOWN.

A. For oil lubricated pumps that are shut down for an extended period of time, it is suggested that the pump be operated for at least 15 minutes every two weeks with the oil feed wide open 2 hours before and during startup in order to maintain a film of oil on the shafting and shaft bearings. This practice is also desirable to restore a film of oil on driver bearings.

B. Bearings on water lubricated pumps are lubricated by the liquid being pumped. On water lubricated pumps over 50 feet of setting, prelubrication is necessary. Extensive damage may result from failure to prelubricate the bearings. A pipe for pre-

lubrication is installed on back of the discharge head and water injected into the pipe for at least 3 minutes to assure ample lubrication for pump settings up to 300 feet. For each additional 100 feet of setting, the prelubrication shall be increased one minute. If no other water supply is available a prelubrication tank is suggested. The prelubrication tank must always be kept full. If the pump is

to be shut down for an extended period of time, operate it, for at least 15 minutes with adequate prelubrication every two weeks.

C. Before resuming normal operations oil should be changed on drivers, gearheads and lubricating oil system. After 15 minutes of operation adjust lateral. Refer to SECTION 13.

SECTION 15 TROUBLESHOOTING

TABLE 15-1 TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
No liquid delivered.	1. Discharge valve closed.	Check that discharge valve is in full open position.
	2. Wrong rotation.	Check for CCW rotation when viewed from above. Check engagement of motor coupling.
	3. Speed too low.	Check if driver is directly across the line and receiving full voltage.
	4. Driver with reduced voltage, or reduced current, starting does not come up to speed.	Consult factory.
	5. Improper lateral adjustment.	Reset lateral, see Section 13.
	6. Lack of prime or breaks suction.	Check standing and pumping water level, see Section 3.
	7. Standing water level is below 1ST stage or pumping water level is below suction.	Increase pump setting, by adding column.
	8. Tail pipe is used and suction lift is too high.	Check NPSH required by pumps against NPSH available. Increase pump setting by increasing column length, if insufficient NPSH available.
No liquid delivered.	9. Static lift too high.	Check distance from pumping water level to discharge, against design head of pump. If greater than pump rating, decrease static head above grade, or consult factory for adding bowl stage or increase impeller diameter.
	10. Suction below well perforations.	Raise pump until suction is approximately 10 feet above well perforations, recheck pumping water level.
	11. Viscosity, specific gravity or dissolved gasses too high.	Consult factory after fluid analysis.
	12. Air leak in tail pipe only if pumping water level is below suction bowl.	Add column or pull pump, and reinstall tail pipe using thread sealer.
	13. Strainer, bowl, impeller plugged.	Pull pump and clean.
	14. Damaged bowl assembly; broken or disconnected shaft.	Pull pump and repair all damaged components.

(Continued next page)

TROUBLESHOOTING (cont'd)

TROUBLE	PROBABLE CAUSE	REMEDY
Not enough liquid delivered.	15. Same as steps 1 thru 6.	Same as Steps 1 thru 6.
	16. Field head requirement greater than design head.	Check system friction losses. Increase discharge piping. Lower head required. Consult factory for adding bowl stages or increase impeller diameter.
	17. Same as steps 8 thru 12.	Same as steps 8 thru 12.
Not enough pressure.	18. See not enough liquid delivered.	See — not enough liquid delivered.
Pump works for a while and quits.	19. See not enough liquid delivered.	See — not enough liquid delivered.
Excessive vibrations.	20. Bent shaft.	Replace or straighten shaft.
	21. Crooked well.	Survey the well and consult factory.

SECTION 16 PUMP DISASSEMBLY

16-1. PUMP DISASSEMBLY

16-2. Clear a large area adjacent to the pump as a storage space for pump parts as they are disassembled. If the pump has a long column made up of several sections, arrange parallel timbers on the ground to support the pump column and shaft sections horizontally.

WARNING

DO NOT ATTEMPT TO LIFT THE ENTIRE PUMP BY THE LIFTING LUGS OF THE DRIVER. THESE LUGS AND BOLTS CANNOT SUPPORT THE WEIGHT OF THE ENTIRE PUMP.

DO NOT ATTEMPT TO LIFT THE ENTIRE PUMP AND DRIVER BY SLINGING TO THE DISCHARGE HEAD. WITH THE DRIVER IN PLACE, THE CENTER OF GRAVITY MAY BE HIGHER THAN THE LIFTING POINTS. THE PUMP MAY TIP AS IT IS LIFTED, WHICH MAY RESULT IN SEVERE DAMAGE TO THE PUMP AND SURROUNDING STRUCTURE AND INJURY TO NEARBY PERSONNEL.

BEFORE OPENING THE CONDUIT BOX OF AN ELECTRICAL MOTOR, BE SURE THAT THE CURRENT TO THE MOTOR IS SHUT OFF. SEVERE INJURY TO PERSONNEL COULD RESULT IF CONTACT WITH LIVE MOTOR LEADS IS MADE.

16-3. In the following pump disassembly procedures references are made to assembly sections of this manual, these sections will aid in the disassembly of the pump.

A. Disconnect discharge and lubrication piping. Remove all external piping, and related hardware attached to the pump. Disengage mechanical seal if provided.

B. Uncouple driver from pump shaft. Refer to Section 10 hollow shaft driver, Section 11 solid shaft driver, and Section 12, gearhead driver.

C. Remove capscrews holding driver and hoist driver off discharge head or driver support and remove driver support, if provided.

D. Remove capscrews (758B) and slide stuffing box (616) off the driveshaft (606). Refer to Sections 8 and 9.

E. Take off bolts and nuts holding the discharge head to the subbase or to the foundation. Lift head, attach elevator clamp just below first column coupling and remove head. Refer to Section 7.

F. For removal of column sections, refer to Section 5 Product Lube Column, and Section 6 for Oil Lube Column.

G. For removal of bowl assembly, hoist the bowl assembly from the sump or well, using elevator clamps. Hoist in the same manner as for the column. Refer to Section 4. Proceed to disassemble the bowl assembly as follows.

16-4. BOWL DISASSEMBLY-PRODUCT LUBRICATION (SEE FIGURE 5-1).

A. Unscrew pump shaft coupling and remove capscrews from top bowl (669).

B. Slide discharge bowl (661) and top bowl off the pump shaft (660), impeller (673) is now exposed.

C. Pull shaft out as far as possible. Strike the impeller hub using a collet hammer or equivalent sliding on the shaft, to drive the hub off the taper collet (677).

D. After impeller has been freed, insert a screwdriver into the slot in the taper collet to spread it and remove it off the shaft. Slide impeller off the shaft. Use the same procedure until entire bowl assembly is completely disassembled.

E. Remove pump shaft from suction bowl (688).

NOTE

DO NOT REMOVE SAND COLLAR (692) UNLESS PUMP SHAFT IS REPLACED.

16-5. BOWL DISASSEMBLY-OIL LUBRICATION. (SEE FIGURE 6-1).

A. Unscrew pump shaft coupling and remove.

B. Remove adapter bearing (668).

C. Follow preceding steps, B, C, D, and E for complete disassembly of bowl assembly.

16-6. REASSEMBLY OF BOWLS ASSEMBLY. (SEE FIGURE 6-1).

A. If a pump shaft (660) is being replaced and a sand collar is provided, see Table 17-7 for positioning of sand collar (692). The sand collar is attached to the shaft by a shrink fit. Heat the collar until it can slip onto the shaft.

WARNING

WEAR PROTECTIVE GLOVES AND USE THE APPROPRIATE EYE PROTECTION TO PREVENT INJURY WHEN HANDLING HEATED PARTS.

B. Slide pump shaft into bearing (690) in suction bowl (688), until sand collar rests on the suction bowl bearing (690). If no collar is used, mark "X" dimension on shaft, see Table 17-7 and slide pump shaft into bearing (690) in suction bowl (688), until "X" dimension is flush with suction bowl hub.

C. Hold the shaft in place with a washer and capscrew. Insert capscrew through the threaded hole in suction bowl and thread into shaft. Slide the first impeller over the shaft until it seats on the bowl.

D. Insert a screwdriver into slot of taper collet (677), spread it and place over the shaft. Hold the impeller against the bowl, slide taper collet into hub.

E. Drive the taper collet in place with a collet hammer.

F. Slide intermediate bowl (670), over impellers and secure with capscrews.

G. Repeat the preceding procedures, checking that the bowl lateral is not being lost after each stage, until all stages are assembled.

NOTE

MARK BOWL FLANGES IN SEQUENCE OF DISASSEMBLY TO AID IN THE REASSEMBLY PROCEDURE.

CAUTION

IF THREADED COUPLING WILL NOT READILY UNSCREW, APPLY HEAT TO COUPLING (NOT TO SHAFT), FOR APPROXIMATELY 30 SECONDS, AT THE SAME TIME APPLYING TORQUE TO THE SHAFT.

SECTION 17 PUMP DATA

17-1. CALCULATING PUMP WEIGHT

17-2. The following tables contain approximate component weights, to be used in estimating the entire pump weight.

TABLE 17-1 BOWLS

SIZE	APPROX. WEIGHT PER STAGE
4 INCH	10 LB.
6	25
7	35
8	50
9	75
10	90
11	115
12	140
14	200
16	350
18	450

TABLE 17-2 COLUMN, SUCTION AND DISCHARGE PIPE

SIZE	WEIGHT/FOOT
2½ INCH	6 LB.
3	8
4	11
5	15
6	19
8	25
10	32
12	44
14	55

TABLE 17-3 DISCHARGE HEAD

SIZE	APPROX. WEIGHT
2½ INCH	40 LB.
4	160
6	300
8	430
10	540
12	900
14	1400

**TABLE 17-4
ELECTRIC DRIVER (WPI)**

HORSE POWER	APPROX. WEIGHT
3 H.P.	100 LB.
5	100
7½	200
10	200
15	250
20	350
25	350
30	400
40	500
50	550
60	650
75	700
100	1500
125	1500
150	1500
200	1700

TABLE 17-5 WEIGHT OF WATER IN PUMP COLUMN

NOM. PIPE SIZE	WT. OF WATER PER FT. OF PIPE
3 IN.	3.0 LB.
4	5.0
5	8.0
6	12.0
8	20.0
10	32.0
12	48.0
14	57.0
16	76.0
18	97.0
20	120.0
24	177.0

NOTE

For liquids other than water multiply the above by the specific gravity of the liquid.

TABLE 17-6 SHAFT

SHAFT SIZE	APPROX. WEIGHT PER FOOT
1 INCH	2.6
1 3/16	3.8
1 1/2	6.0
1 11/16	7.6
1 15/16	10.0
2 3/16	12.8
2 7/16	15.8
2 11/16	19.3
2 15/16	23.0
3 3/16	27.1

TABLE 17-7 SAND COLLAR LOCATION DIMENSION — BOWL SHAFT

PUMP SIZE	"X" DIMENSION
4D	2.75
6A	3.25
6J	2.75
6D	3.62
7A	3.25
8A	3.25
8S	3.63
8J	4.00
8D	4.37
9A	3.50
10A	4.50
10J	5.25
10D	6.38
10L	6.12
11A	5.44
12J	5.88
12D	6.87
14J	7.00
14H	7.50
14D	8.25
16D-BELL	7.25
16D-BOWL	8.75
18H	7.50

17-3. The following example is given to calculate approximately the entire pump weight.

1. BOWL WEIGHT = ESTIMATE WT. PER STAGE X NO. OF STAGES
2. COLUMN WEIGHT = SETTING X (COLUMN WT. + SHAFT¹)
3. HEAD WEIGHT
4. DRIVER WEIGHT
 PUMP WEIGHT = TOTAL OF 1 + 2 + 3 + 4
 LIFTING WEIGHT (PUMP MINUS DRIVER) = TOTAL OF 1 + 2 + 3

¹) NOTE: For pumps with enclosing tubes; tube and shaft weight may be estimated by multiplying shaft weight by 3.

SECTION 18

RECOMMENDED LUBRICANTS

MANUFACTURER	GREASES FOR LINE SHAFTS, SUCTION BOWL BEARINGS AND SHAFT PACKINGS	TURBINE OILS FOR LINE SHAFT, SUCTION BOWL BEARINGS AND SIMILIAR APPLICATIONS		TURBINE OILS FOR GEAR DRIVES VERTICAL PUMPS	
	TEMPERATURE —32°F TO 120°F	TEMPERATURES BELOW 32°F	TEMPERATURE ABOVE 32°F	TEMPERATURE BELOW 32°F	TEMPERATURE ABOVE 32°F
American Oil Co.	Amoco Lithium Grease All-Weather	Rykon Industrial Oil No. 11	Rykon Industrial Oil No. 31	Rykon Industrial Oil No. 21	Rykon Industrial Oil No. 51
Atlantic Richfield Co.	Arco Multipurpose Grease	Duro S-150 LP	Duro S-150 or Duro S-150 LP	Duro AWS-315	Duro 600
Cato Oil & Grease	Mystik JT-6	2107 Water Well Turbine Oil or 1872 Antiwear Hyd./Ind. Oil A.5	2107 Water Well Turbine Oil or 1872 Antiwear Hyd./Oil A.5	1875 Antiwear Hyd./Ind Oil C or 1837 R & O Gearhead C	Mystik JT-7 SAE 80/90 Antiwear Ind. Oil F, or 1855 R & O Gearhead F
Cities Service Oil Co.	Citgo H-2	Citgo Pacemaker 15	Citgo Packemaker 15	Citgo Pace-maker 20	Citgo Pace-maker 60
Gulf Oil Co.	Gulfcrown Grease No. 2 or Gulf Supreme Grease No. 2	Paramount 39	Harmony 44	Paramount 45	Harmony 69
Humble Oil & Refining Co.	Lidok No. 2	Nuto 43 or Esstic 42	Teresstic 43 or Nuto 43	Nuto 43 or Esstic 42	Terresstic 65 or Nuto 63
Mobil Oil Corp.	Mobilux No. 2	DTE 23	DTE BB	DTE 23	DTE Extra Heavy or DTE AA
The Pennzoil Co.	Pennzoil 705 HDW	Pennbell No. 1	Pennbell No. 2	Pennbell No. 2	Pennbell No. 5
Shell Oil Co.	Alvania EP Grease 2 or Alvania EP Grease 1 (for prolonged ambient below 0°F.)	Tellus Oil 23	Tellus Oil 27	Tellus Oil 29	Tellus Oil 41
Texaco, Inc.	Novatex Grease No. 2	Regal Oil A (R & O)	Regal Oil A (R & O)	Regal Oil C (R & O)	Regal Oil F (R & O)
Fiske Bros. Refining Co.	Lubriplate 130AA (0° to 120°F)	Lubriplate 3V	Lubriplate 3V	Lubriplate APG 90	Lubriplate APG 90

SECTION 19

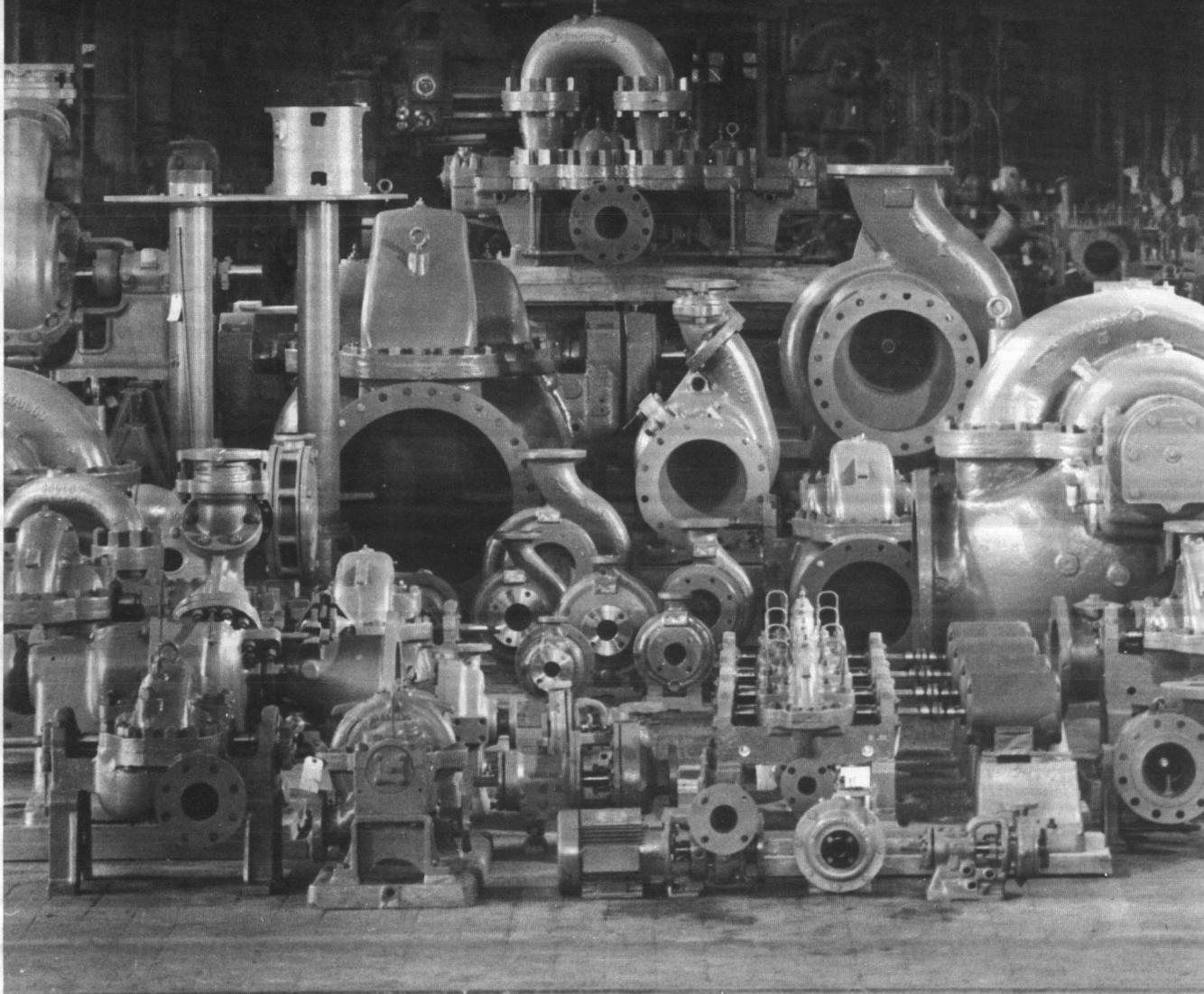
PARTS LIST

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
600	HEAD—DISCHARGE	649	COUPLING—THREADED LINESHAFT
602	SUPPORT—DRIVER	650*	RETAINER—KEYED LINESHAFT
604	NUT—ADJUSTING	652	RETAINER—OPEN LINESHAFT
606	DRIVESHAFT	653	BEARING—OPEN LINESHAFT
608	HEADSHAFT	654	TUBE—SHAFT ENCLOSING
610	HUB-DRIVER COUPLING	656	BEARING—ADAPTER
612	SPACER—COUPLING	658	STABILIZER—TUBE
613	PLATE—ADJUSTING	660	PUMPSHAFT—TURBINE
614	HUB—PUMP COUPLING	661	BOWL—DISCHARGE—OPEN LINE
616	BOX—STUFFING	662	BEARING—DISCHARGE BOWL
617	BEARING—STUFFING BOX	664	BEARING—THROTTLE
618	GLAND—SPLIT PACKING	666	BOWL—DISCHARGE— ENCLOSED LINE
620A	PACKING—STUFFING BOX	668	BEARING—ADAPTER
620B	PACKING—TENSION PLATE	669	BOWL—TOP
621	RING—LANTERN	665*	RING—SEAL
623	NUT—TUBE TENSION	670	BOWL—INTERMEDIATE
624	LINE—BYPASS	672	BEARING—INTERMEDIATE BOWL
625	PLATE—TUBE TENSION	673	IMPELLER—TURBINE
626	NUT—TUBE TENSION	677	COLLET—TAPER
627	BEARING—TUBE TENSION	688	BOWL—SUCTION
628	BEARING—TUBE TENSION	690	BEARING—SUCTION
629	NIPPLE—ENCLOSING TUBE	692	COLLAR—SAND
630*	RESERVOIR—OIL	697	PIPE—TAIL
631	NIPPLE—THREADED COLUMN	698	STRAINER—SUCTION
632*	BRACKET—OIL RESERVOIR	735B	NUT—HEX GLAND STUD
633*	VALVE—SIGHT FEED	739A	STUD—STUFFING BOX
634*	VALVE—SOLENOID	747B	PIPE—PLUG DISCHARGE HEAD DRAIN
635*	LINE ASSEMBLY—LUBRICATION	747E	PIPE PLUG—SUCTION
639	RING—LOCK THREADED	747N	PIPE PLUG—PRELUBE CONNECTION
641	COLUMN—TOP	747P	PIPE PLUG—DISCHARGE BLEED OFF CONNECTION
642*	COLUMN—INTERMEDIATE	758B	CAPSCREW—STUFFING BOX
644	COLUMN—BOTTOM	779A	GASKET—STUFFING BOX
645	COUPLING—THREADED COLUMN	789C	WASHER—PACKING
646	LINESHAFT		





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