

FILE FOLDER

DESCRIPTION ON TAB:

T.C. 325

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Building removed + cased well
on contract # 7665

For: East Coast Construction Co.

Pump # TC 325

Job: U. S. Marine Corp Air Station
Jacksonville, N. C.

TURBINE PUMP CURVE

N62470-79-C-4476 Replace Water Wells, CLNC

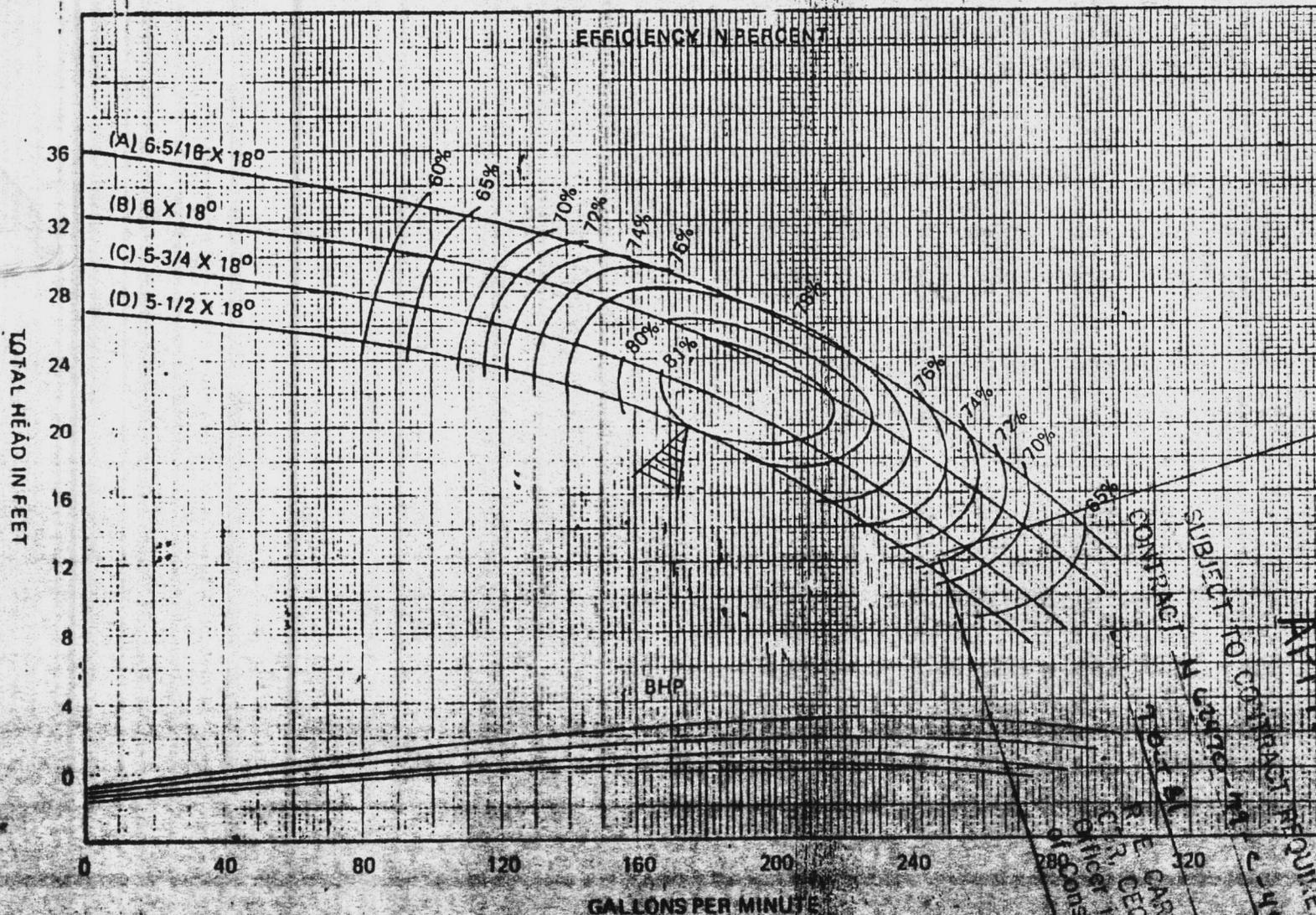
JAN. 15, 1970

SECTION
2120

BKS

175 GPM @ 60' TDH

81% EFF. = 3.26 BHP



NUMBER OF BOWLS	CHANGE EFFICIENCY AS FOLLOWS
1	-3
-2	-1

Change in efficiency may affect both head and horsepower

Bowl Dia.	7-1/2 In.
Bowl No.	3591-S, C.I., ENAM.
Impeller No.	3693, BRONZE
Eye Area	6.60 Sq. In
Imp. Type	SEMI-OPEN K = 4.42

STAGE PERFORMANCE

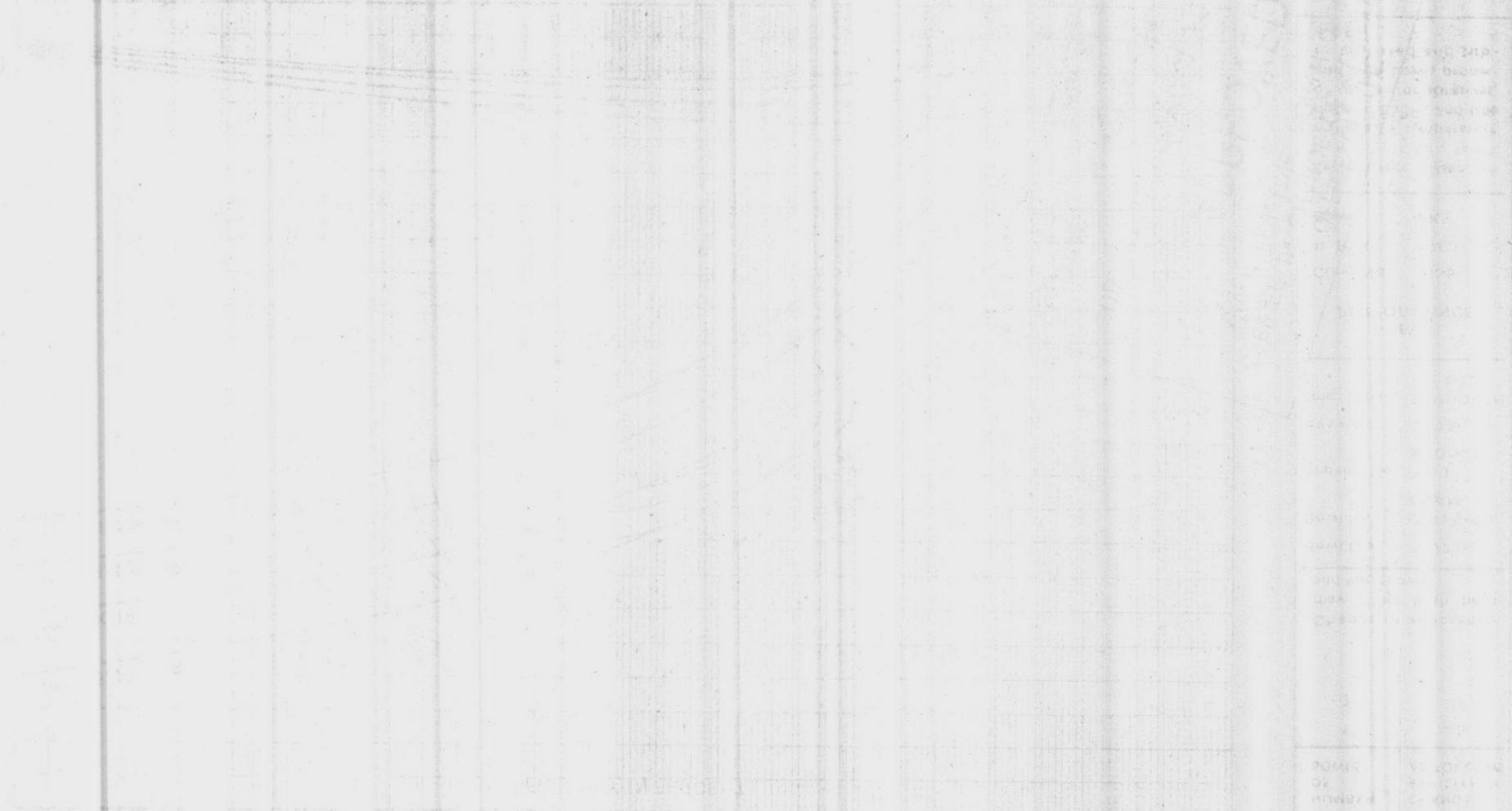
Curve No.	KK-5
R. P. M.	1760
	BKS

Performance based on pumping clear, fresh water at a temperature not over 85°F., and free of gas, air or abrasives. Bowls properly adjusted and sub-

BRAKE HORSEPOWER IN LEISURE
 CHARGE NO. 1760
 OFFICE OF THE SUPERINTENDENT OF CONSTRUCTION
 APPROVED
 SUBJECT TO CONTRACT REQUIREMENTS
 CONTRACT # 24499
 J. E. CARLSON
 R. E. CEC, USN
 OFFICE OF THE SUPERINTENDENT OF CONSTRUCTION

80 230

STATIONING



1000	1000
900	900
800	800
700	700
600	600
500	500
400	400
300	300
200	200
100	100
0	0

0181 21 VAL

0181 21 VAL

TURBINE PUMP CURVE

1000 1000

1000 1000

1000 1000

1000 1000

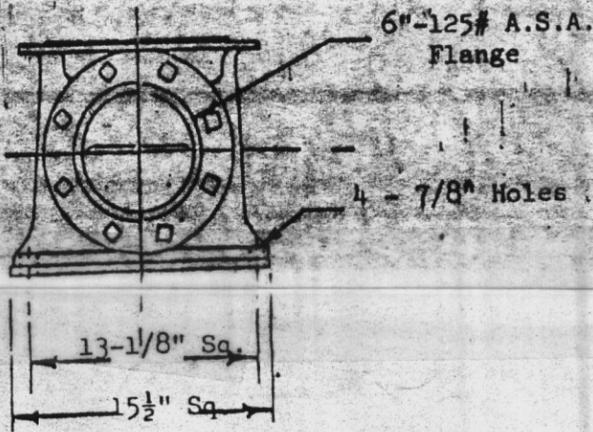
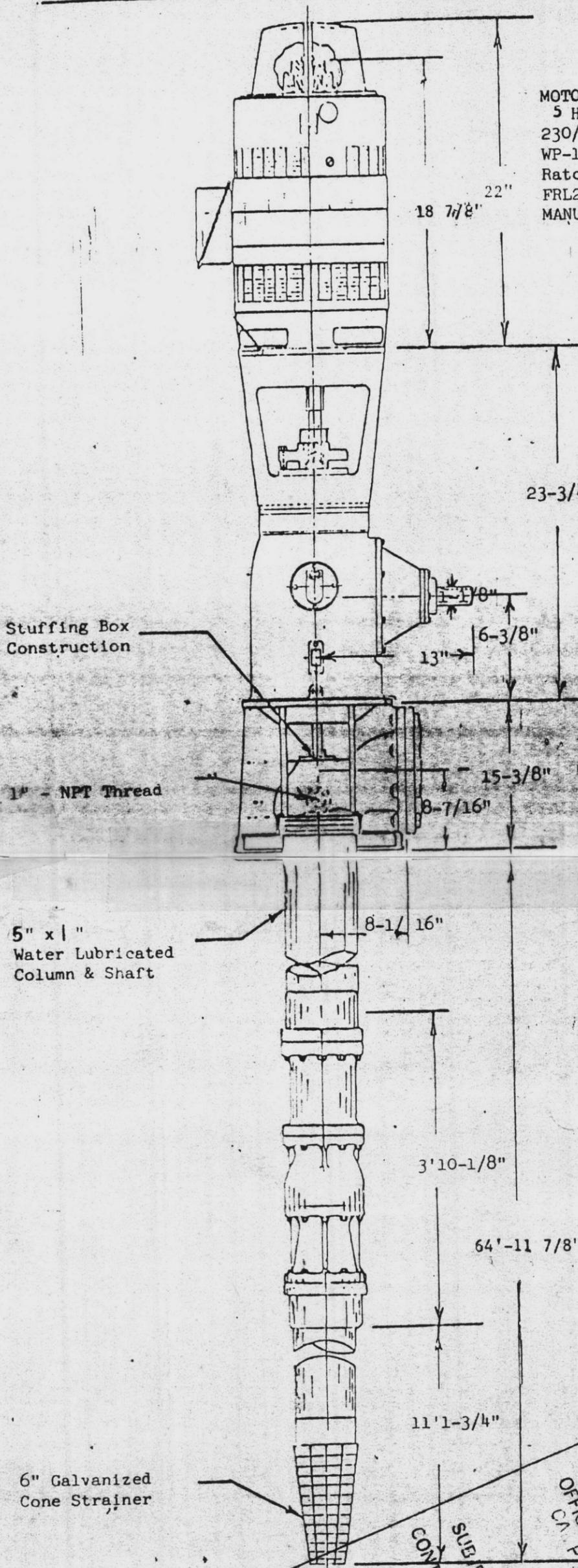
Jacuzzi

Turbine Pumps

Comp. Meyer

MOTOR SPECIFICATIONS:
 5 H.P. 1800 RPM 3 Phase
 230/460V 60HZ V.H.S. H.T. Motor
 WP-1 Enclosure Non-Reversing
 Ratchet 1" C.B. 10" B.D.
 FRL254TP
 MANUFACTURED BY: GENERAL ELECTRIC

GEAR DRIVE SPECIFICATIONS:
 Model - Combination Type
 Non-Reversing Ratchet 1:1 Ratio
 With Sliding Clutch
 MANUFACTURED BY:



PUMP MODEL 5- 8KSD3

DIS. HEAD MODEL L6AA

TC 325

DESIGN POINT:
 CAPACITY 175 GPM
 TOTAL HEAD 60 FEET

FOR: EAST COAST CONSTRUCTION
 JOB: U.S. MARINE CORP AIR STATION
 JACKSONVILLE, N.C.

FOUNDATION PLATE DRAWING SEPARATE

BY: E.E. ROWEDDA

OFFICER IN CHARGE OF THE CONSTRUCTION
 CA. P. LEJEUNE, NORTH CAROLINA

APPROVED

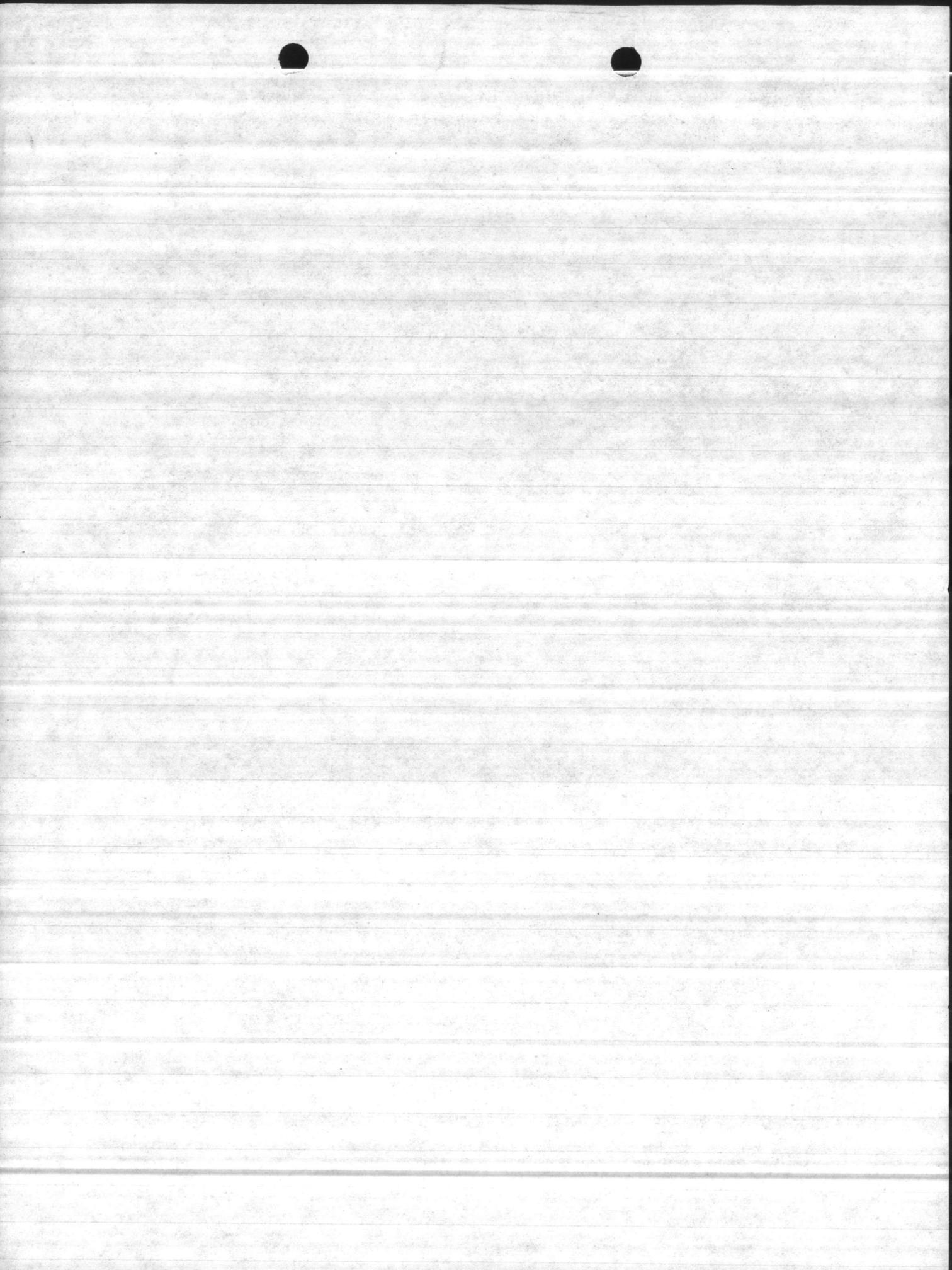
SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT ALG3400-13-C-1476

L. L. 2 0418

R. E. CARLSON
 C. B. CECIL
 Officer in Charge
 of Construction

Air Line TC-325- 60'





N.W.W.A.
N.C.W.W.A.

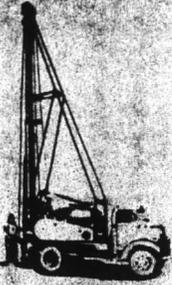
CAROLINA WELL AND PUMP COMPANY, INC.

Complete Well and Pump Service

P. O. BOX 1085

TELEPHONE 776-3415

SANFORD, NORTH CAROLINA 27330



Camp Lejeune, N. C.

Camp Geiger - T.C. 325 - *NG 2926-79-Q-4976*

Drillers Log

Driller - John Murchison

December 17, 1980

EAST COAST CONSTRUCTION CO. INC.

P. O. BOX 5004

JACKSONVILLE, N. C. 28540

0	-	1	Top Soil
1	-	9	Sand and Clay
9	-	21	Sand
21	-	32	Clay with Sand
32	-	38	Clay with Rock
38	-	70	Rock
70	-	125	Clay "Soft"
125	-	151	Rock
151	-	165	Rock - Hard
165	-	175	Rock
175	-	200	Clay

TC 325

LAURENCE WOOD & COMPANY, INC.

SANFORD, NORTH CAROLINA 27050

1990-1991

1990

"Hello Analysis, Goodbye Error"

WATER ANALYSIS LABORATORY

802 HAMLET HIGHWAY
BENNETTSVILLE, SOUTH CAROLINA 29312

CONSULTANTS FOR:
INDUSTRY
MUNICIPALITIES
HOME OWNERS
DEVELOPERS
IRRIGATION
OTHERS

(803) 479-4639

DATE: November 25, 1980

Report To: Carolina Well & Pump Co.
Sanford, N. C.

1 Sample
Date Analyzed: 10/25/80
Sample Number: Camp Lejuene
Sample #1 - Bottle

Analysis Results--Parts Per Million Well TC-325
N62970-29-C-0076

Determination	
pH	<u>7.1</u>
Iron (Fe)	<u>0.1</u>
Nitrate (NO ₃)	<u>Trace</u>
Fluoride (F)	<u>2.2</u>
Manganese (Mn)	<u>Trace</u>
Total Hardness (CaCO ₃)	<u>82</u>
Chlorides (Cl)	<u>221</u>
Sulfate (SO ₄)	<u>115</u>
Phosphate (PO ₄)	<u>0</u>
Magnesium (Mg)	<u>1.9</u>
Calcium (Ca)	<u>29.6</u>
Carbonate (CO ₃)	<u>0</u>
Bicarbonate (HCO ₃)	<u>195</u>
Hydroxide (OH)	<u>0</u>

Determination	
Carbon Dioxide (CO ₂)	<u>6</u>
Total Acidity (CaCO ₃)	<u>8</u>
Calcium Hardness (CaCO ₃)	<u>74</u>
Magnesium Hardness (CaCO ₃)	<u>8</u>
Carbonate Hardness (CaCO ₃)	<u>82</u>
Noncarbonate Hardness (CaCO ₃)	<u>0</u>
Alkalinity (Phenolphthalein) (CaCO ₃)	<u>0</u>
Carbonate Alkalinity (CaCO ₃)	<u>0</u>
Bicarbonate Alkalinity (CaCO ₃)	<u>160</u>
Total Alkalinity (CaCO ₃)	<u>160</u>
Total Dissolved Solids	<u>875</u>
Specific Conductance (micromhos at 25°C)	<u>1250</u>
Appearance When Analyzed	<u>Clear</u>
Odor When Analyzed	<u>Not Objectional</u>

EAST COAST CONSTRUCTION CO. INC.
E. O. BOX 5004
JACKSONVILLE, N. C. 28540

SIGNED _____
LABORATORY DIRECTOR

ANALYTICAL METHODS REFERENCES: 'STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTE-WATER,' APHA, AWWA AND WPCF AND 'METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES,' WATER SUPPLY PAPER 1454 (1960), U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

PROPERTY

HOME OWNER

ADDRESS

03120 01

1000 1st St

San Francisco, CA

APPLICANT NAME

John Doe

DATE

10/15/2010

1

2

3

0

0

100

200

300

400

500

600

1

Wells Analysis, Goodbye

WATER ANALYSIS LABORATORY

802 HAMLET HIGHWAY
BENNETTSVILLE, SOUTH CAROLINA
29512

CONSULTANTS FOR:
INDUSTRY
MUNICIPALITIES
HOME OWNERS
DEVELOPERS
IRRIGATION
OTHERS

(803) 479-4639

DATE: November 25, 1980

Report To: Carolina Well & Pump Co.
Sanford, N. C.

Date Analyzed: 10/25/80
Sample Number: Camp Lejuene
Sample #2
(Short Tape) TOP

Analysis Results--Parts Per Million

Well TC - 325
146297-29-C-9476

<u>Determination</u>	
pH	<u>6.9</u>
Iron (Fe)	<u>0.3</u>
Nitrate (NO ₃)	<u>Trace</u>
Fluoride (F)	<u>0.5</u>
Manganese (Mn)	<u>Trace</u>
Total Hardness (CaCO ₃)	<u>149</u>
Chlorides (Cl)	<u>12</u>
Sulfate (SO ₄)	<u>4.2</u>
Phosphate (PO ₄)	<u>0</u>
Magnesium (Mg)	<u>9.6</u>
Calcium (Ca)	<u>43.2</u>
Carbonate (CO ₃)	<u>0</u>
Bicarbonate (HCO ₃)	<u>250</u>
Hydroxide (OH)	<u>0</u>

<u>Determination</u>	
Carbon Dioxide (CO ₂)	<u>2</u>
Total Acidity (CaCO ₃)	<u>2</u>
Calcium Hardness (CaCO ₃)	<u>108</u>
Magnesium Hardness (CaCO ₃)	<u>41</u>
Carbonate Hardness (CaCO ₃)	<u>149</u>
Noncarbonate Hardness (CaCO ₃)	<u>0</u>
Alkalinity (Phenolphthalein) (CaCO ₃)	<u>0</u>
Carbonate Alkalinity (CaCO ₃)	<u>0</u>
Bicarbonate Alkalinity (CaCO ₃)	<u>205</u>
Total Alkalinity (CaCO ₃)	<u>205</u>
Total Dissolved Solids	<u>221</u>
Specific Conductance (micromhos at 25°)	<u>315</u>
Appearance When Analyzed	<u>Clear</u>
Odor When Analyzed	<u>Not Objectionable</u>

EAST COAST CONSTRUCTION CO. INC.
P. O. BOX 5004
JACKSONVILLE, N. C. 28540

SIGNED _____
LABORATORY DIRECTOR

ANALYTICAL METHODS REFERENCES: 'STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTE-WATER,' APHA, AWWA AND WPCF AND 'METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES,' WATER SUPPLY PAPER 1454 (1960), U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

INQUIRY
EXHIBITION

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

1974/1975

"Hello Analytic Goodbye Error"

WATER ANALYSIS LABORATORY

802 HAMLET HIGHWAY
BENNETTSVILLE, SOUTH CAROLINA
29512

CONSULTANTS FOR:
INDUSTRY
MUNICIPALITIES
HOME OWNERS
DEVELOPERS
IRRIGATION
OTHERS

(403) 479-4639

DATE: November 25, 1980

Report To: Carolina Well & Pump Co.
Sanford, N. C.

Date Analyzed: 10/25/80

Sample Number: Camp Lejuene

Sample #2 TOP
(Long Tape)

Analysis Results--Parts Per Million Well TC-325
N62420-79-C-0006

Determination	
pH	6.8
Iron (Fe)	0.35
Nitrate (NO ₃)	Trace
Fluoride (F)	0.4
Manganese (Mn)	Trace
Total Hardness (CaCO ₃)	145
Chlorides (Cl)	32
Sulfate (SO ₄)	4.6
Phosphate (PO ₄)	0
Magnesium (Mg)	10.2
Calcium (Ca)	40.8
Carbonate (CO ₃)	0
Bicarbonate (HCO ₃)	229
Hydroxide (OH)	0

Determination	
Carbon Dioxide (CO ₂)	3
Total Acidity (CaCO ₃)	2
Calcium Hardness (CaCO ₃)	102
Magnesium Hardness (CaCO ₃)	43
Carbonate Hardness (CaCO ₃)	145
Noncarbonate Hardness (CaCO ₃)	0
Alkalinity (Phenolphthalein) (CaCO ₃)	0
Carbonate Alkalinity (CaCO ₃)	0
Bicarbonate Alkalinity (CaCO ₃)	180
Total Alkalinity (CaCO ₃)	180
Total Dissolved Solids	228
Specific Conductance (micromhos at 25°)	325
Appearance When Analyzed	Clear
Odor When Analyzed	Not Objectionable

EAST COAST CONSTRUCTION CO. INC.

P. O. BOX-5004

JACKSONVILLE, N. C. 28540

SIGNED

Water Analysis Laboratory
802 Hamlet Highway
Bennettsville, South Carolina 29512
LABORATORY DIRECTOR

ANALYTICAL METHODS REFERENCES: 'STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTE-WATER,' APHA, AWWA AND WPCF AND 'METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES,' WATER SUPPLY PAPER 1454 (1960), U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.



INDUSTRIAL
COMMUNICATIONS
DEPARTMENT

30 DEC 29 P12: 39

180

December 22, 1980

Officer in Charge of Construction
Building 1005, Marine Corps Base
Camp LeJeune, N.C. 28542

Ref: Replace Four Water Wells
MCB, Camp LeJeune, N.C.
Contract N62479-79-C-4476

Gentlemen:

We are outlining below our recommendations for the development of the four wells under the subject contract. The driller's log, electric log and laboratory chemical analysis for all four wells are enclosed for your reference.

Well TC325 (replaces TC202) Camp Geiger

40 V.F. 18" pit casing

25 ft. of 25-slot stainless steel screens set at
45 - 70 foot level

Estimated yield 175 to 200 GPM

Alternate: The water at the deeper level aquifer is high in chlorides (221 PPM) and the specific conductance is 1250, both of which are abnormal and could create problems in your water filtration system. Should you desire to take the deeper water, a line of screens could be set at the 125 - 150 foot level which would result in a total well production of approximately 300 GPM.

M267 (replaces M243) Montford Point

40 V.F. 18" pit casing

40 ft. of 25-slot screens set at the 50 - 70 and the
125 - 145 foot levels

Estimated yield 130 to 150 GPM.

NOTE: There is no water available at any other depth.

HP655 (replaces HP625) Hadnot Point

40 V.F. 18" pit casing

50 ft. of 25-slot screens set at the 60 - 80 foot and
the 105 - 135 foot levels

Estimated yield 150 - 175 GPM

C
O
P
Y

December 22, 1944

Officer in Charge of Construction
Building 1005, Marine Corps Base
Camp Lejeune, N.C. 28541

Re: Replace four steel walls
MCR, Camp Lejeune, N.C.
Contract number 13-0-4113

Enclosure:

We are outlining below our recommendations for the replacement of the four steel walls at the site.

We enclosed the same drawings.

1. The steel walls are to be replaced with
40 V.A. 18' steel casing
25 ft. of concrete slabs on grade.

Estimated cost for the walls is

ATTACHED: The plan of the walls and the
high in character steel wall and the
distance is 1250, both of which are enclosed.

NOTE: Enclosed are also
40 V.A. 18' steel casing
40 ft. of concrete slabs on grade.

40 V.A. 18' steel casing

COPY

Officer in Charge
of Construction

-2-

December 22, 1980

TT25 (replaces TT53) Tarawa Terrace

40 V.F. 18" pit casing

40 ft. of 25-slot screens set at the 70 - 95 ft. and
the 155 - 170 ft. levels.

Estimated yield 100 - 125 GPM

NOTE: This area has a history of low water yield.

Please review the enclosed data and advise of your decisions covering the development of the permanent wells. Final designs of the pumps are pending your decisions.

Should you need additional information, please do not hesitate to ask.

Yours very truly,

EAST COAST CONSTRUCTION CO., INC.

W. H. Myers

WHM/ck

May 22, 1980

Officer in Charge
of Construction

TTSS (replaces TT21) Tanya Tanya
40 V.F. 18" off easting
40 ft. of 22" pipe for 10' to 12' 1/2"
the job - 170 ft. Tanya
Estimated yield 100 - 125 GPM
NOTE: This area has a history of low water yield

Please review the enclosed data for the area
covering the development of the
of the pumps and bearing in mind
Should you have any questions
324

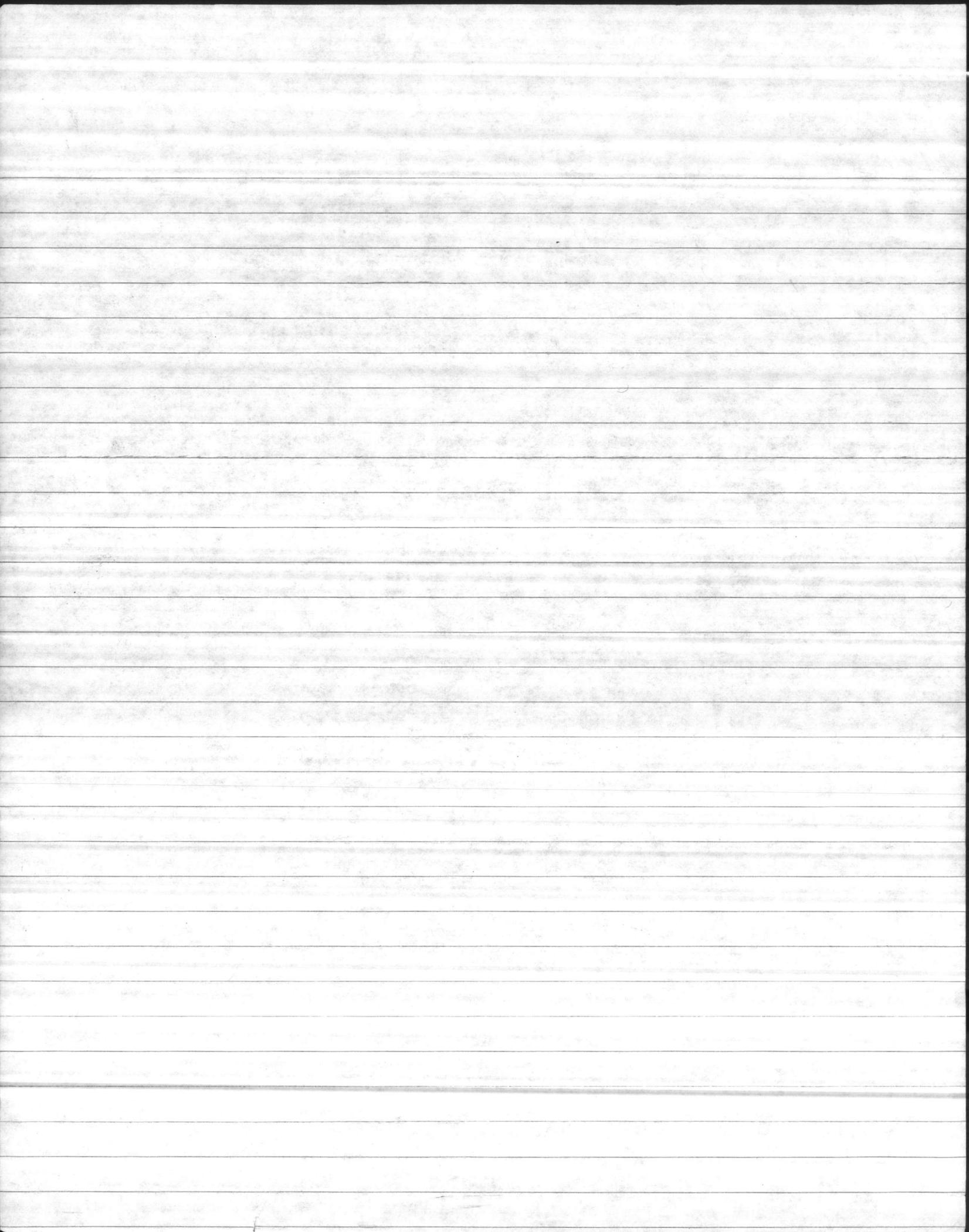
Yours very truly,
EAST COAST CONSTRUCTION CO., INC.

W. H. Myers
WMM/56

10-10-88

TC 325

S-L	41
PSI	15
GPM	100 -



CONTRACTOR'S SUBMITTAL TRANSMITTAL

5ND LANTDIV 4-4355/3 (Rev. 6/78)

CONTRACT NO. 79-C-4476	TRANSMITTAL NO. 5-R-1	DATE 09/28/81
----------------------------------	---------------------------------	-------------------------

FROM CONTRACTOR
East Coast Construction Co., Inc.

TO
ROICC

PROJECT TITLE AND LOCATION
**Replace Water Wells
MCAS New River & MCB Camp Lejeune NC**

CONTRACTOR USE ONLY

*List only one specification division per form.

List only one of the following categories on each transmittal form, and indicate which is being submitted

- Contractor Approved
 OICC Approval
 Deviation/Substitution For OICC Approval

REVIEWER USE ONLY

****ACTION CODES**
 A-Approved
 D-Disapproved
 AN-Approved as noted
 RA-Receipt acknowledged
 C-Comments
 R-Resubmit

ITEM NO.	PROJ. SPEC. SECT. & PARA. and/or PROJ. DWG. NO.	ITEM IDENTIFICATION (Type, size, model no., Mfg. name, dwg. or brochure number)	NO. OF COPIES	ACTION CODES	REVIEWER'S INITIALS CODE AND DATE
1	15221	Resubmitted pump curves and pump dimensions data on pump #TC325 to meet 80% efficiency.	5	A	TCS SL

CONTRACTOR'S COMMENTS

COPY OF TRANSMITTAL AND SUBMITTALS TO ROICC

CONTRACTOR REPRESENTATIVE (Signature)
[Signature]

DATE RECEIVED BY REVIEWER

FROM (Reviewer) **OICC JAXNC AREA**

TO **EAST COAST CONSTRUCTION CO., INC.**

- Submittals are returned with action indicated. Approval of an item does not include approval of any deviation from the contract requirements unless the contractor calls attention to and supports the deviation.
- Submittals are forwarded to LANTDIV with A-E recommendations indicated in REVIEWER USE ONLY Section and in comments below on ONE COPY of the transmittal form.

REVIEWER'S COMMENTS

RECEIVED
 OCT 16 1981
 EAST COAST CONSTRUCTION CO., INC.

COPIES TO:
 ROICC (2)
 LANTDIV (1)
 A-E (1)

DATE
13 October 1981

SIGNATURE
[Signature]
J. A. ELLIOTT, LTJG, CRC, USN

PRICE

Quantity Allowed

PROJ. SEC. NO.
2 PART. NO.
PROJ. Dwg. NO.

ITEM IDENTIFICATION
(Type and model no. and other
descriptive features)

Quantity
Required

UNIT
PRICE

REVISIONS
INITIALS
DATE AND DATE

REVISIONS COMMENTS

COPY OF TRANSMITTAL AND SUBJECT TO BE

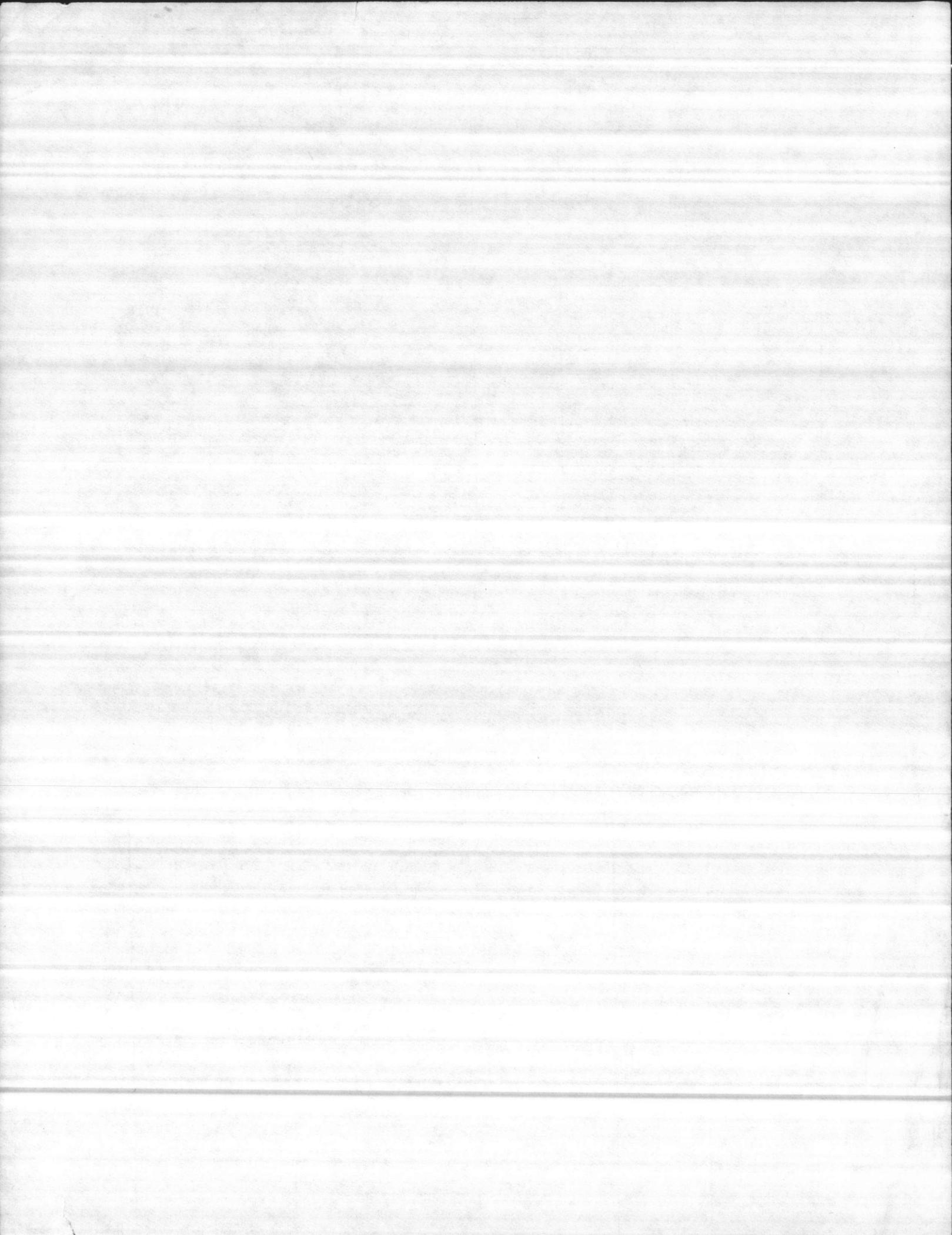
DATE OF REVISION

REVISION NO.

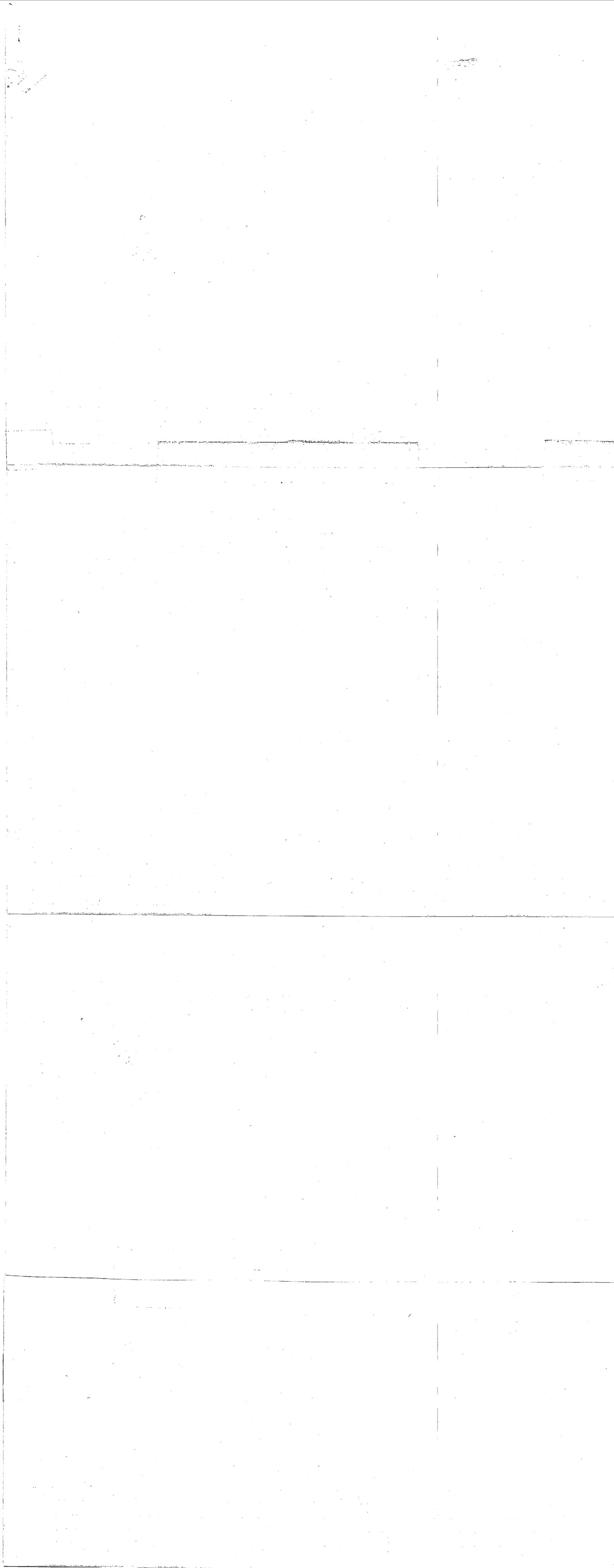
REVISION COMMENTS

APPROVED
DATE

APPROVED







FILE FOLDER

DESCRIPTION ON TAB:

TC 901 Well G

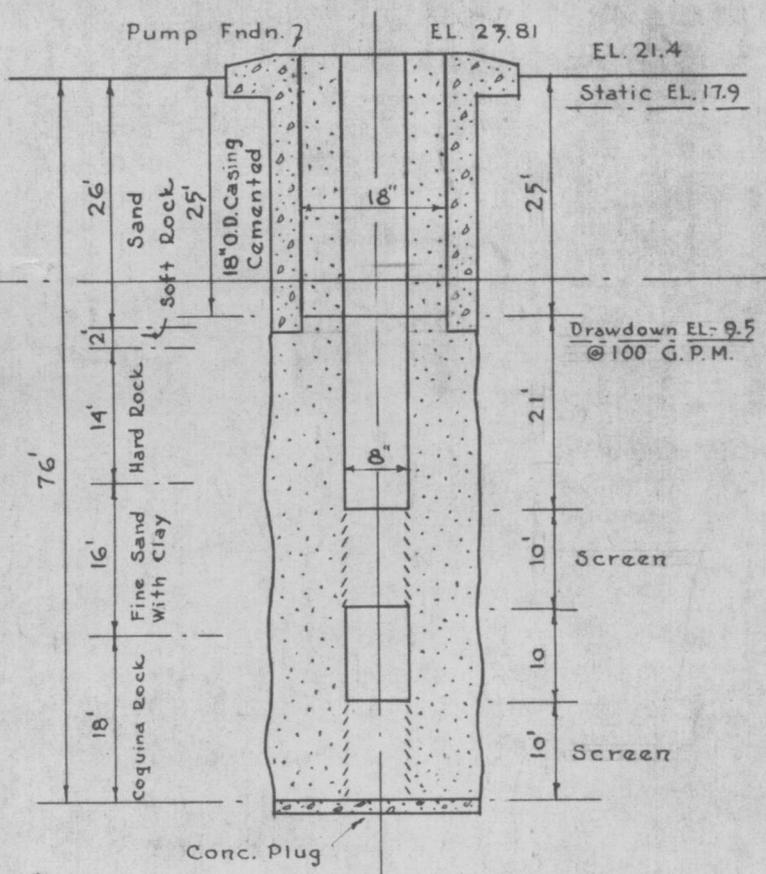
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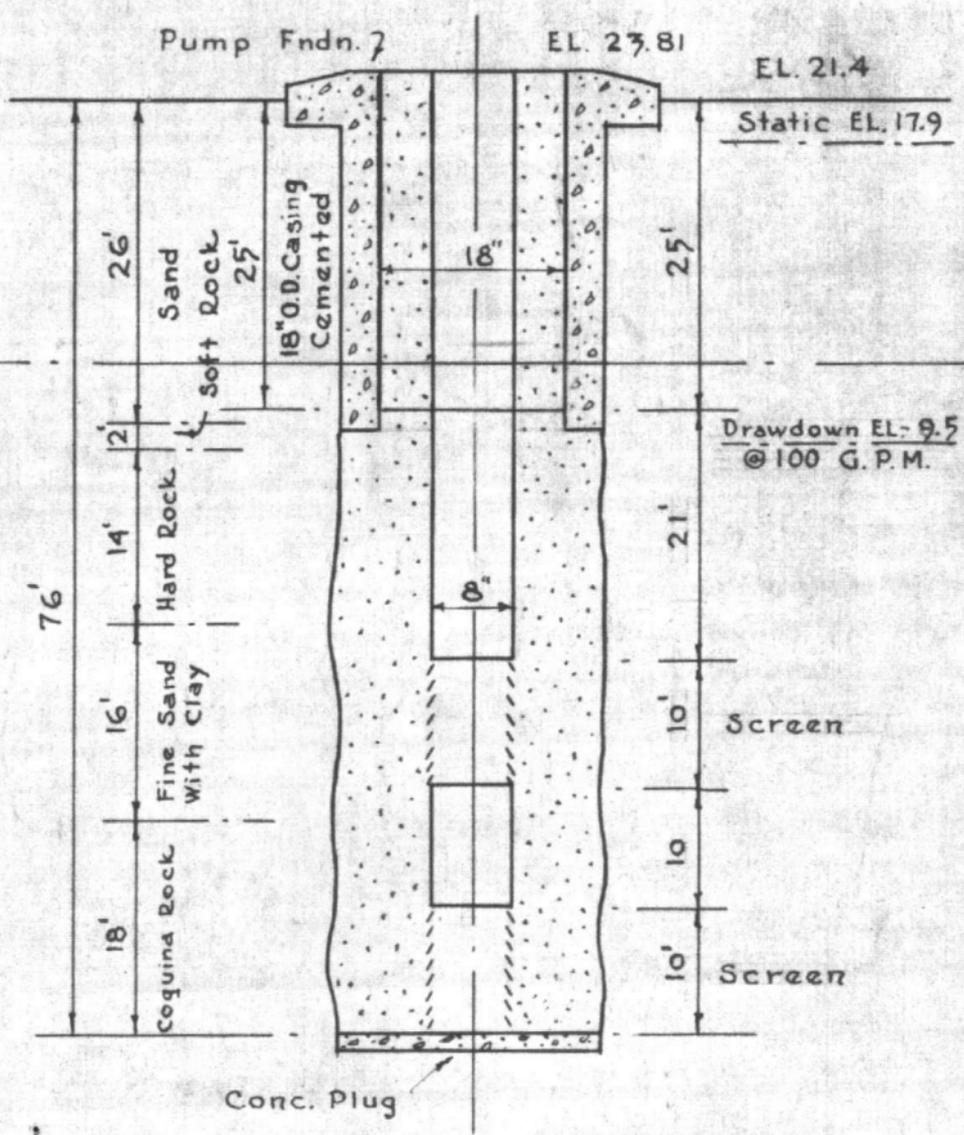
Bulldj + Well
cap 2-2-54
Contract #
7605

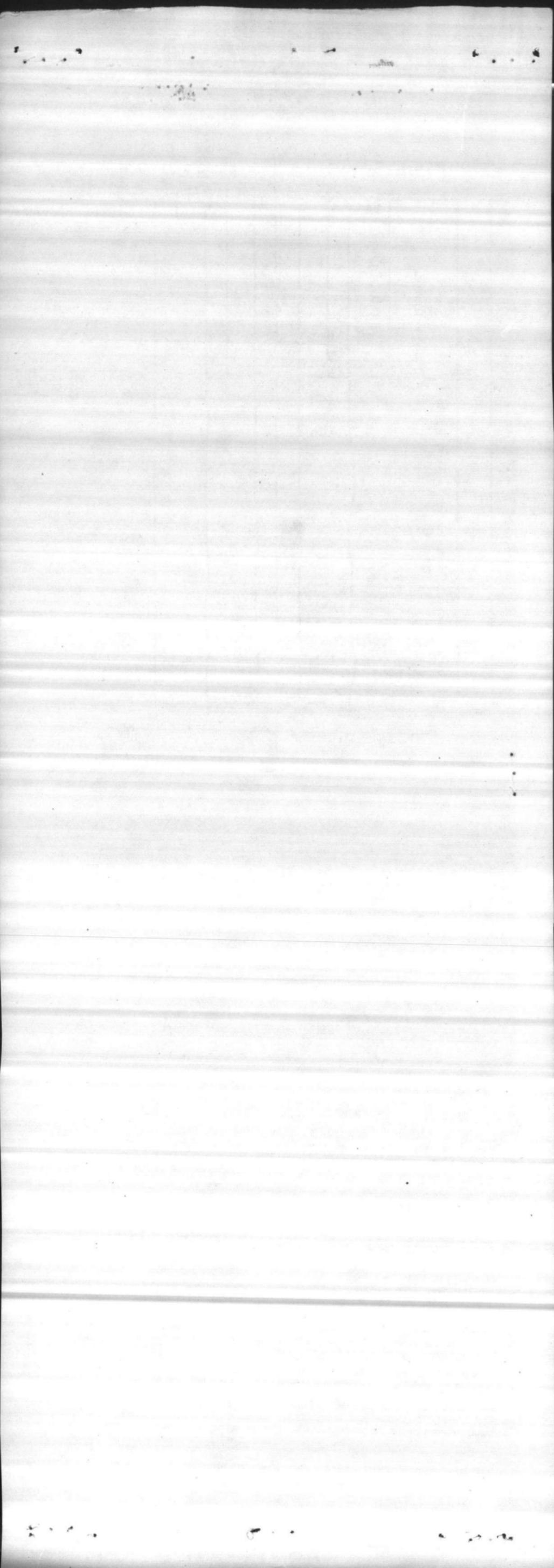
100 G.P.M. - SINGLE DRIVE -



T.C.A. WELL "G"

100 G.P.M. - SINGLE DRIVE -





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, 1966

1. AGENCY CODE MC	2. TYPE Q	3. LATITUDE 34° 43' 45" N	4. LONGITUDE 77° 27' 27" W	5.
-----------------------------	---------------------	-------------------------------------	--------------------------------------	----

6. AGENCY STATION NO. TC-901	7. STATION NAME TC508-0
--	-----------------------------------

8. DRAINAGE BASIN CODE No. 6 Letter N	9. STATE CODE 32	10. COUNTY CODE 133	11. COUNTY NAME ONslow
--	----------------------------	-------------------------------	----------------------------------

12. PERIOD OF RECORD Began 1941 Discontinued	Y <input type="checkbox"/> Continuous <input type="checkbox"/> Interruption Exceeds 1 Year	13.	14.
--	---	-----	-----

15. SITE	<input type="checkbox"/> 101 Stream	<input type="checkbox"/> 102 Canal	<input type="checkbox"/> 103 Lake	<input type="checkbox"/> 104 Reservoir	<input type="checkbox"/> 105 Estuary	<input type="checkbox"/> 106 Spring	<input checked="" type="checkbox"/> 107 Well	<input type="checkbox"/> 110 Other
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16. FREQUENCY OF MEASUREMENT	<input type="checkbox"/> 201 Continuous Recorder	<input type="checkbox"/> 202 Telemetered	<input type="checkbox"/> 203 Daily	<input type="checkbox"/> 204 Weekly	<input type="checkbox"/> 205 Monthly	<input type="checkbox"/> 206 Quarterly	<input type="checkbox"/> 207 Seasonal	<input type="checkbox"/> 208 Annual	<input type="checkbox"/> 209 Other Periodic	<input checked="" type="checkbox"/> 210 Occasional
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17. TYPES OF DATA AVAILABLE		
<i>Physical</i>	<i>Chemical</i>	<i>Organic</i>
<input type="checkbox"/> 311 Temperature	<input type="checkbox"/> 331 Dissolved solids	<input type="checkbox"/> 351 Pesticides (insecticides, herbicides, etc.)
<input type="checkbox"/> 312 Specific Conductance	<input checked="" type="checkbox"/> 332 Chlorides Only	<input type="checkbox"/> 352 Synthetic detergents
<input type="checkbox"/> 313 Turbidity	<input type="checkbox"/> 333 Nutrients (Nitrogen and phosphorus compounds)	<input type="checkbox"/> 353 Other
<input type="checkbox"/> 314 Color	<input type="checkbox"/> 334 Common ions	<i>Biologic</i>
<input type="checkbox"/> 315 Odor	<input checked="" type="checkbox"/> 335 Hardness	<input type="checkbox"/> 361 Coliforms
<input type="checkbox"/> 316 Radioactivity	<input type="checkbox"/> 336 Radiochemical	<input type="checkbox"/> 362 Other Micro-organisms
<input type="checkbox"/> 317 pH (field)	<input type="checkbox"/> 337 Dissolved oxygen	<input type="checkbox"/> 363 BOD
<input checked="" type="checkbox"/> 318 pH (lab)	<input type="checkbox"/> 338 Other Gases	<input type="checkbox"/> 364 Other
<input type="checkbox"/> 319 Eh	<input type="checkbox"/> 339 Other	<i>Sediment</i>
<input type="checkbox"/> 320 Other		<input type="checkbox"/> 371 Concentration
		<input type="checkbox"/> 372 Particle size
		<input type="checkbox"/> 373 Other

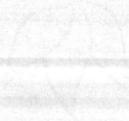
18. SUPPLEMENTARY DATA FOR SITE		
<input type="checkbox"/> 421 Surface Water Station	<input type="checkbox"/> 423 Water Stage or Level	<input type="checkbox"/> 425 Time of Travel
<input type="checkbox"/> 422 Ground Water Station	<input checked="" type="checkbox"/> 424 Water discharge	<input type="checkbox"/> 426 Drainage Area

19. STORAGE OF DATA		
<input type="checkbox"/> 501 Periodic Report	<input checked="" type="checkbox"/> 503 Not Published	<input type="checkbox"/> 505 Data on Magnetic Tape
<input type="checkbox"/> 502 Areal Report	<input type="checkbox"/> 504 Data on Punchcard	<input type="checkbox"/> 506 Other

20. OFFICE AT WHICH DATA AVAILABLE		
Office	BASE MAINTENANCE DEPARTMENT	
Street No.	MARINE CORPS BASE	
City, State, Zip	CAMP LEJEUNE, N. C. 28542	City Code 0735

21. OFFICE COMPLETING FORM	
BASE MAINTENANCE DEPARTMENT	

22. COMPILER'S NAME F. E. TEW, JR.	23. DATE Month _____ Year 1966
--	--



WATER ANALYSIS

By N. H. Kellan

Date 2 ~~Aug~~
2 SEPT 41

Sample from Well No 5 9 hrs pumping
West of A St 2000 ft South of 6th St
By Lane Atlantic Co.

Total Solids 332 PPM Volatile Solids 80 PPM

Suspended Solids 52 " Dissolved Solids 280 "

Phenolphthalein Alkalinity 0 " Silica 23.5 "

Total Alkalinity 220 " Ferrous Iron 0 "

Chlorides 26 " Total Iron 2.6 "

Sulphates 6.2 " Aluminum 1.5 "

Carbonates 0 " Calcium 139.5 "

Bicarbonates 220 " Magnesium 2.8 "

Sodium 2.3 "

pH 7.2 Soap Hardness as CaCO₃ _____ "

Mineral Hardness as CaCO₃ _____ "

Odor Slight H₂S

Turbidity Slight

REMARKS _____

IRON settles out on Aeration

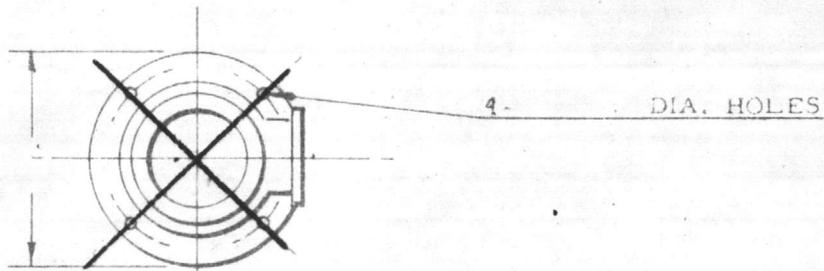
WATER ANALYSIS

Well No. 2
West of A St. 500 ft South of E 21
St. Lake ATLANTIC Co.

Item	Value	Item	Value
Total Solids	332	Total Solids	332
Total Hardness	280	Total Hardness	280
Calcium	0	Calcium	0
Magnesium	0	Magnesium	0
Total Alkalinity	280	Total Alkalinity	280
Chloride	0	Chloride	0
Sulfate	0	Sulfate	0
Iron	0	Iron	0
Copper	0	Copper	0
Zinc	0	Zinc	0
Lead	0	Lead	0
Mercury	0	Mercury	0
Nitrate	0	Nitrate	0
Nitrite	0	Nitrite	0
Ammonia	0	Ammonia	0
Phosphate	0	Phosphate	0
Fluoride	0	Fluoride	0

For sales on Atlantic

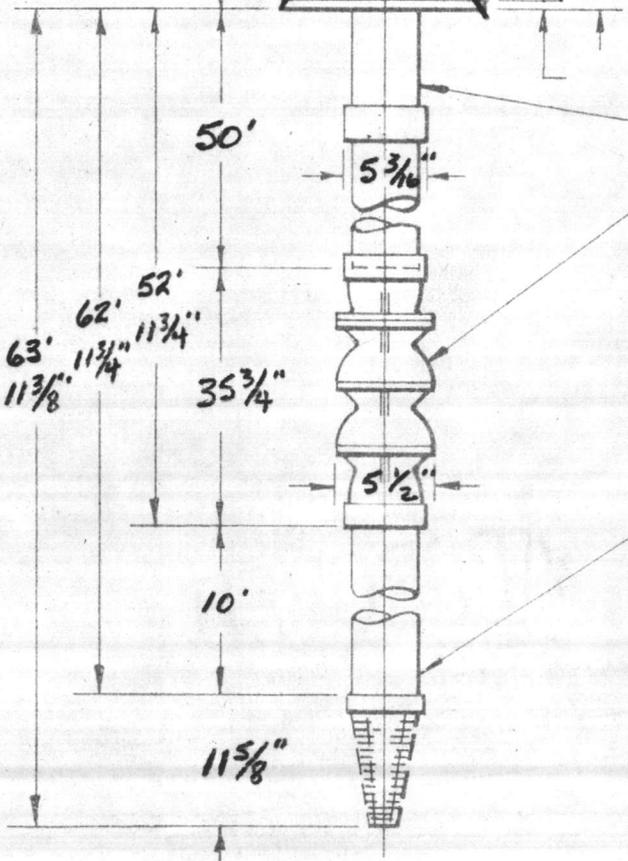
JOHNSTON VERTICAL TURBINE PUMP



Furnished by others
 VERTICAL HOLLOW SHAFT MOTOR

HP	PHASE	CYCLE
	VOLT	RPM
		ENCLOSURE

Furnished by others
 TYPE "A" DISCHARGE HEAD
 " X 125# FLANGE



4" X 1 1/2" X 1" GWI COLUMN ASSEMBLY
 7 STAGE 6 BS BOWL ASSEMBLY

CONDITIONS:
 70 USGPM
 81 FT. TOTAL HEAD
 LIQUID WATER
 SPEC. GRAV. 1.0 @ °F PUMPING TEMP.

4" SUCTION PIPE 4" CONE STRAINER

CUSTOMER _____
 PC# _____
 DEALER **HEATER WELL Co.**
 PO# _____
 JOHNSTON SERIAL # _____
 JOHNSTON QUOTATION # _____

NOTE: DO NOT USE FOR CONSTRUCTION
 UNLESS CERTIFIED

Pump # 6

JOHNSTON PUMP COMPANY
 PASADENA, CALIFORNIA

5-20-57

H-1253-A

PUBLIC WORKS DEPARTMENT
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT NO. 3886

SPEC. NO. 3886-156

TITLE Repairs to Wells, Camp Beiger

DATE: June 57 H. F. Lunn, D.

BY DIRECTION OF OFFICER
IN CHARGE OF CONSTRUCTION 213

HYDRAULIC PERFORMANCE IS CONTINGENT ON WELL PUMPING PUMP WITH CLEAR, FRESH NON-AERATED OR NON-GASEOUS WATER FREE FROM DETRITUS WITH NO SUCTION LIFT AND TEMPERATURE NOT TO EXCEED 88 DEGREES FAHRENHEIT

NOTE: ALL COLUMN LOSSES ARE INCLUDED

CUSTOMER: _____

P.O.# _____

DEALER: HEATER WELL

Co. P.O.# _____

JOHNSTON SERIAL: _____

Pump # 6

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE: ANY CHANGE IN EFFICIENCY CHANGES EITHER THE HEAD OR HORSEPOWER IN PROPORTION

TOTAL HEAD IN FEET

95
85
75
65

Head/Capacity

Operating Conditions:
70 GPM at 81' TDH
Pumping

80
75
70

EFFICIENCY

Boat Efficiency

Brake H.P. Req'd.

2.25

2.15

60 65 70 75 80

U. S. GALLONS PER MINUTE

HORSE POWER

IMPELLER BRZ.

DIA.

JOHNSTON PUMP CO.



VERTICAL PUMPS

PASADENA • CALIFORNIA • USA

PERFORMANCE 7 STAGE

6BS

DEEP WELL TURBINE PUMP

1800

R. P. M.

DATE: 5-20-57 BY: JOM

CURVE SHEET NO. _____

PUBLIC WORKS DEPARTMENT
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT NO. 3886 SPEC. NO. 3886/56
TITLE Repairs to Wells, Camp Lejeune
DATE: 4 June 57 H. F. Evans, Jr.
BY DIRECTION OF OFFICER
IN CHARGE OF CONSTRUCTION JB

WELL # 0

PLACE - Geiger

DATE - 28 Jan 1957

ORIGINAL WELL CAPACITY G.P.M. 100

ORIGINAL WELL		TESTING	
Depth of Well	76'	Depth after Cleaning	77'
Pump Size		Test Pump Setting	56
Pump Setting	50	Measured Static Water Level	15
Static Water Level	17.9	Depth of Air Line	56

Static 17 on gauge

CONDITION OF WELL - Cleaned muck and sand to 77'. Much oil. Broke suction and pumped sand at 100 G.P.M. Well cleared at 75 G.P.M. PL 55'.

STATIC LEVEL ON GAUGE

Inches of water in dizometer tube	G.P.M.	30 Min.	45 Min.	60 Min.	1 Hour
	50	PL	PL	PL	PL 38
	65	PL	PL	PL	PL 43
	80	PL	PL	PL	PL 49.5
	100	PL	PL	PL	PL -
		PL	PL	PL	PL
		PL	PL	PL	PL
		PL	PL	PL	PL
		PL	PL	PL	PL
		PL	PL	PL	PL
		PL	PL	PL	PL

RECOVERY		
10 Sec.		40
20	PL	32
30	PL	31
40	PL	30
50	PL	29
60	PL	28
2 Min.	PL	25
4	PL	23
8	PL	21
16	PL	20
32	PL	17

- Broke suction

DATE

TIME

High after cleaning

Low after

Low temp setting

High temp

Lowest temp setting

Lowest temp

High of air flow

High of air

REVISION OF BILL

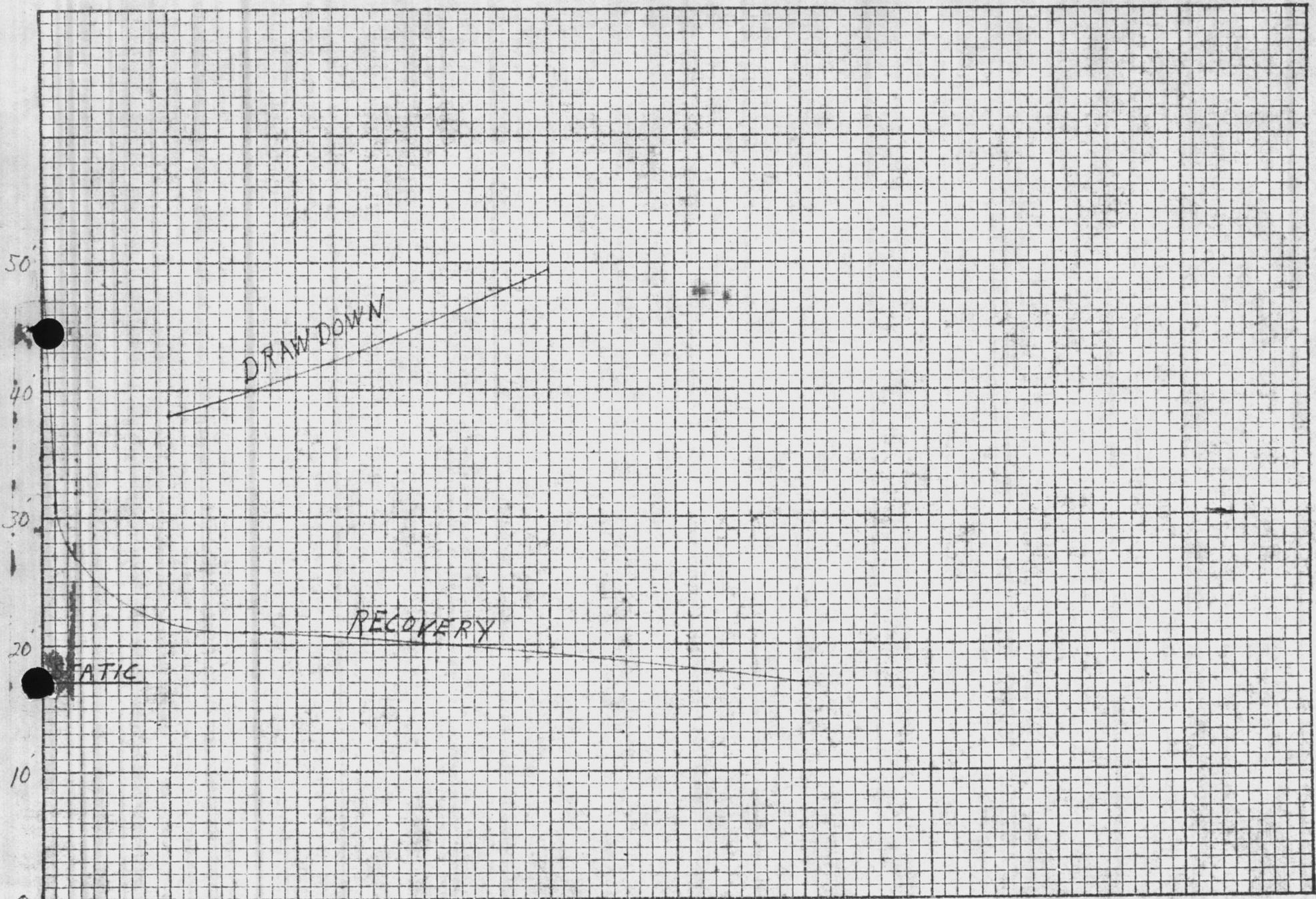
REVISION OF BILL

NO.	DESCRIPTION	AMOUNT	TOTAL
1			
2			
3			
4			
5			
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7			
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10			
11			
12			
13			
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99			
100			

Well # G-TC

Date	Line Ft.	D.D. El.	G.P.M.	Static El.	Shut of Head	D.D. Ft.
------	-------------	-------------	--------	---------------	-----------------	-------------

Air Line



JAN 28, 1957

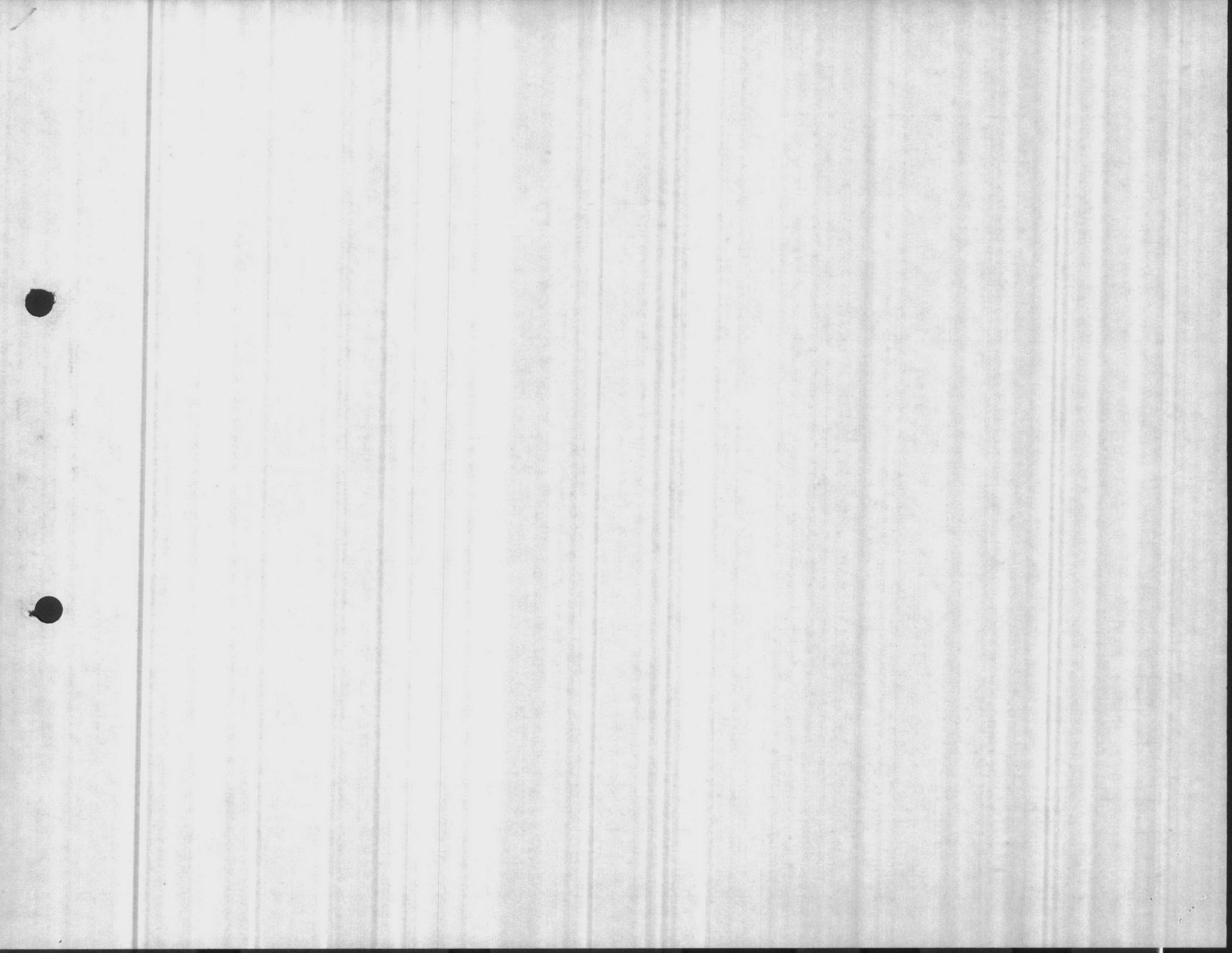
DATA SHEETS

CAMP LEJEUNE
SPEC # 3886

NO. 700-10

CHARLES BRUNING COMPANY, INC.
10 x 10 to the Inch.
PRINTED IN U. S. A.

WELL G
CAMP GEIGER



WATER ANALYSIS

By _____

Date 8-13-43

Sample from WELL G
TENT CAMP

Total Solids _____ PPM Dissolved Solids _____ PPM

Suspended Solids _____ PPM Volatile Solids _____ PPM

Phenol. Alk. as CaCO₃ 0 PPM Silica as SiO₂ _____ PPM

Total Alk. " " 204 " Ferrous Iron as Fe _____ "

Carbonates " " _____ " Total Iron as Fe 3.5 "

Bicarbonates " " _____ " Aluminum as Al. _____ "

Chlorides as Cl. 9 " Calcium as Ca. _____ "

Sulphates as SO₄ _____ " Magnesium as Mg. _____ "

Nitrites as NO₂ _____ " Sodium as Na. _____ "

Carbon Dioxide as CO₂ _____ "

pH 7.3 Soap Hardness as CaCO₃ 172 PPM

Odor _____ Turbidity _____

REMARKS _____

WATER ANALYSIS

No.

Date

Sample from

PER	Total Solids	_____
PER	Dissolved Solids	_____
PER	Suspended Solids	_____

PER	Total Alkalinity as CaCO ₃	_____
"	Total Alkalinity	_____
"	Total Hardness as CaCO ₃	_____
"	Total Hardness	_____
"	Calcium as Ca	_____
"	Magnesium as Mg	_____
"	Chloride as Cl	_____
"	Sulfate as SO ₄	_____
"	Nitrate as NO ₃	_____

Carbon Dioxide as CO₂

Iron as Fe

Copper as Cu

Zinc as Zn

FILE FOLDER

DESCRIPTION ON TAB:

TC 504 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**

Removed Bedding & cap well
2-1-94 Central # 7605



Marine Barracks
New River, N.C.

WELLS-PERMANENT WATER SUPPLY-REGIMENTAL AREA
By Layne Atlantic Company

Project P-250-1-4

WELL NO. "J"
As on MB Drawing T.C. 223

Location: 60' S.E. of State Highway #17, approximately 3000' west of intersection of "G" Street and Fifth Street in T.C. #1.

Date Drilled: January 1942

Drilling Equipment: Rotary Rig and Rotary Bit.

Drilling Operations And Status:
A 23" diameter hole was drilled to 26', and 24' 0" of 18" diameter pit casing set and fixed in place by filling the annular space outside the casing with Portland cement. A 17½" diameter hole was drilled to a depth of 113', and hydraulic underreaming of the hole was started. In that the rock strata first encountered was at a depth of 42" below ground surface, the material supporting the pit casing gave way, and the well was necessarily abandoned. A new location 75' farther down (Southwest) the road was selected and new operations started.

At the new location a 23" diameter hole was drilled to a depth of 45' and an 18" diameter pit casing set 2' into shell rock, and the annular ring outside the pit casing filled with Portland Cement.

A 17½" diameter hole was drilled to a depth of 113' below ground surface. The portion of the hole below the pit casing was hydraulically underreamed. After underreaming and cleaning out, an 8" diameter pump casing was set on a cement plug, and the annular space made by the underreaming was filled with Cape May Gravel, using about 20 cubic yards of gravel. (See casing log).

Static Water Level: 3' Below ground surface.

Tests: The well was pumped for 22 hours and showed a nearly constant discharge of 265 g.p.m. with a 40' 6" draw-down. One hour's pumping with a discharge of 420 g.p.m. had less than 59' of drawdown.

Water analysis: A water analysis dated January 12, 1941 was made.

Log of Formations:

0' - 24'	White Sand
24' - 25'	Gray sand and gravel
25' - 43'	Gray sand
43' - 104'	Shell rock and sand
104' - 110'	Sand with some shell
110' - 113'	Rock (coquina) and some sand
113' - -	Blue clay

Log of Casings:

0' - 50'	Blank Pipe 4" diameter
50' - 60'	Silicon Bronze Screen
60' - 75'	Blank Pipe
75' - 85'	Silicon Bronze Screen
85' - 100'	Blank Pipe
100' - 113'	Cement Plug

John E. Womeldorf

The well was drilled for 25 feet and found a quantity of water of 100 gallons per minute at a depth of 25 feet. The water was found to be of good quality and was used for domestic purposes.

1912

Water was found at a depth of 25 feet.

1912

Water	100
Gas	20
Oil	5
Coal	10
Iron	15
Lead	20
Mercury	25
Other	30
Total	115

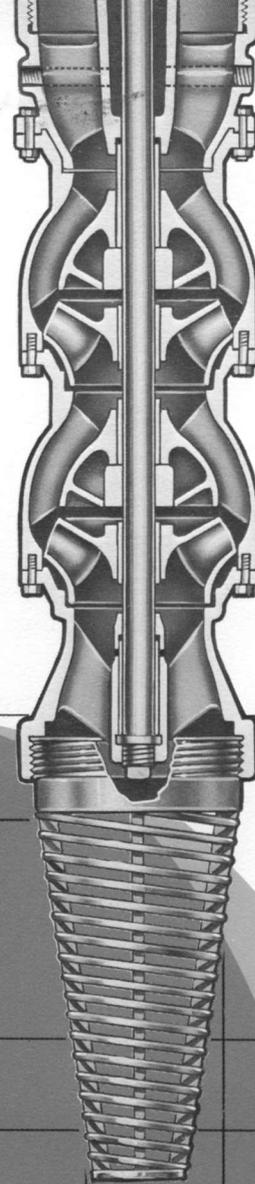
1912

Water	100
Gas	20
Oil	5
Coal	10
Iron	15
Lead	20
Mercury	25
Other	30
Total	115

1912

John A. ...

Fairbanks Morse Vertical Turbine Pumps



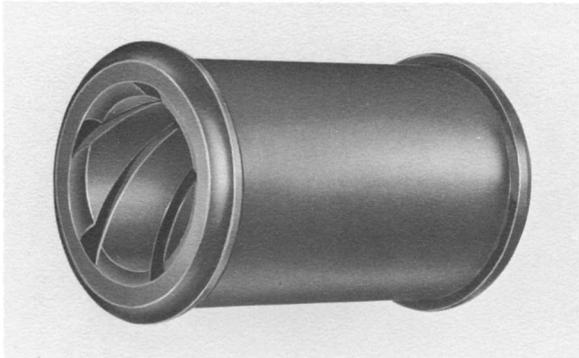
F/M 7000 THE OUTPERFORMER

First Choice For Deep Well Irrigation

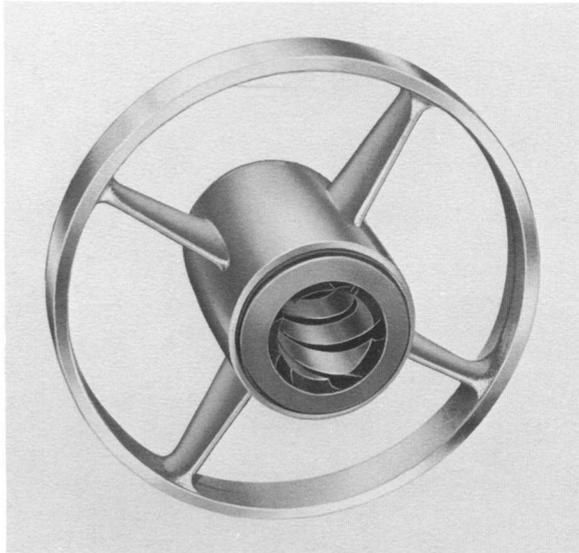
Here's how the
F/M 7000 can save you
money four ways...

- 1 LOWER FIRST COST.** New hydraulic design increases pump efficiency . . . achieves higher head per stage . . . cuts down the number of stages required.
- 2 LOWER OPERATING COSTS.** Higher pump efficiency over wider range of flow means one pump can do more jobs . . . less power required to obtain desired head pressure than most pumps with comparable size and rating.
- 3 LOWER MAINTENANCE COSTS.** Bronze impellers and rock-hard glass enameling of water passages in pump bowls increase service life . . . all pumps balanced during manufacturing process to reduce vibration and increase pump life.
- 4 LESS DOWNTIME.** Enameled bowls reduce buildup of foreign matter that could cause lockup during shutdown . . . parts designed for easy disassembly . . . standardization of more parts permits greater interchangeability . . . simplifies stocking . . . speeds delivery.

New, improved bearing retainer assembly has longer service life under tough pumping conditions



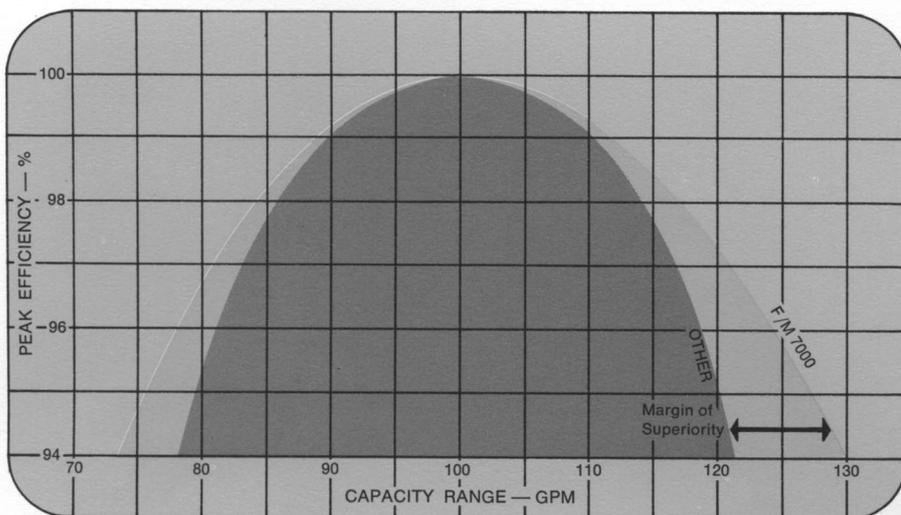
BEARING . . .
water-lubricated . . .
abrasion-resistant rubber
with flanged ends to
assure firm positioning in
the retainer.



BEARING RETAINER . . .
streamlined for minimum
friction loss . . .
rugged construction
where it counts.

F/M 7000 . . . the outperformer for deep well irrigation

These comparative curves have been plotted from laboratory tests conducted with the new F/M 7000 and a typical competitive pump of the same rated capacity.

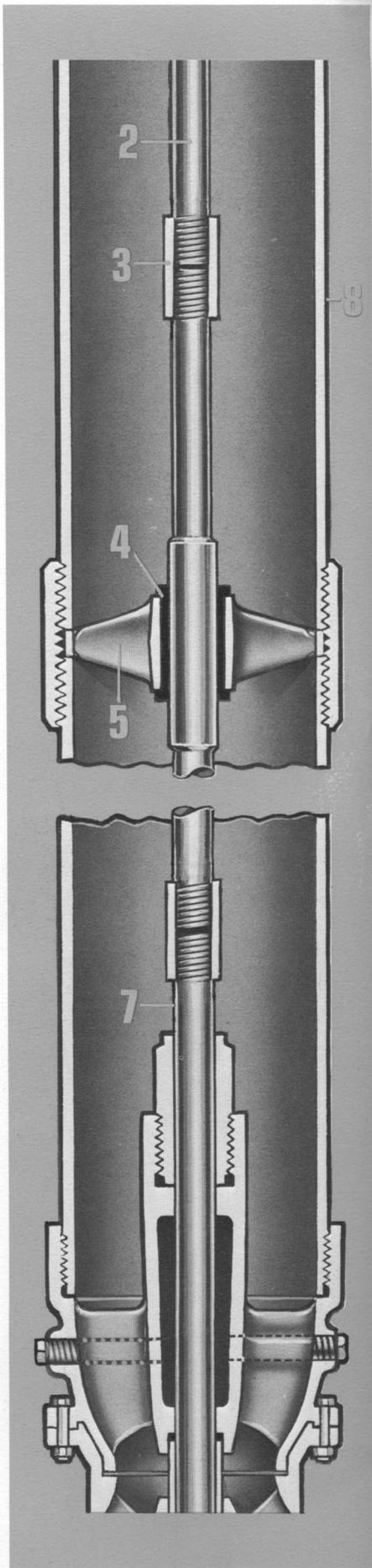


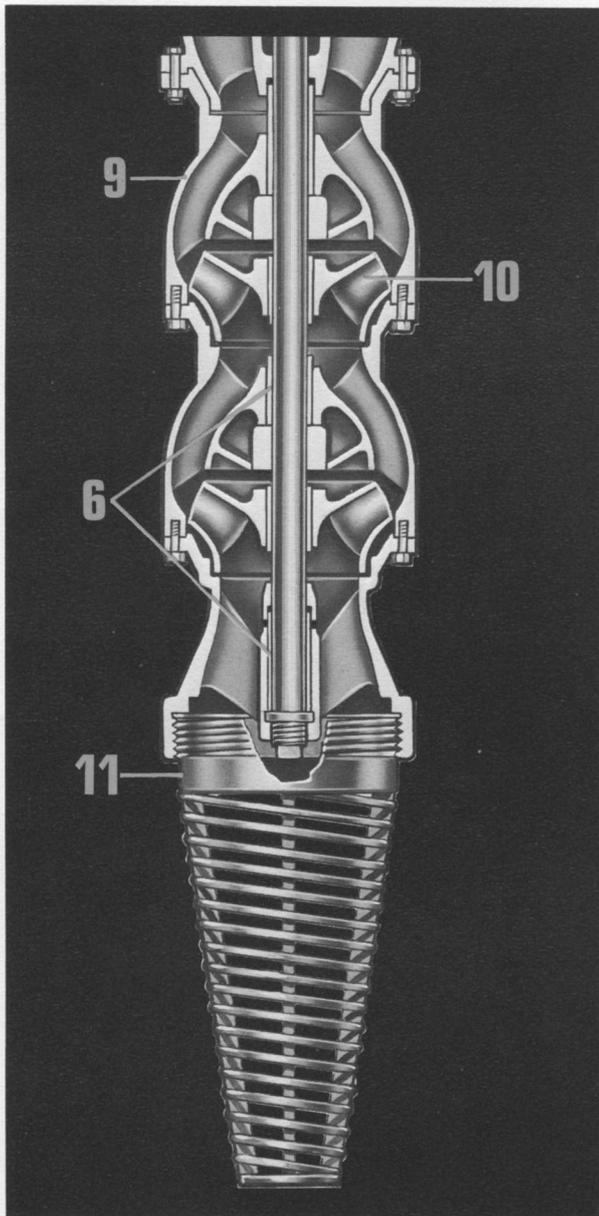
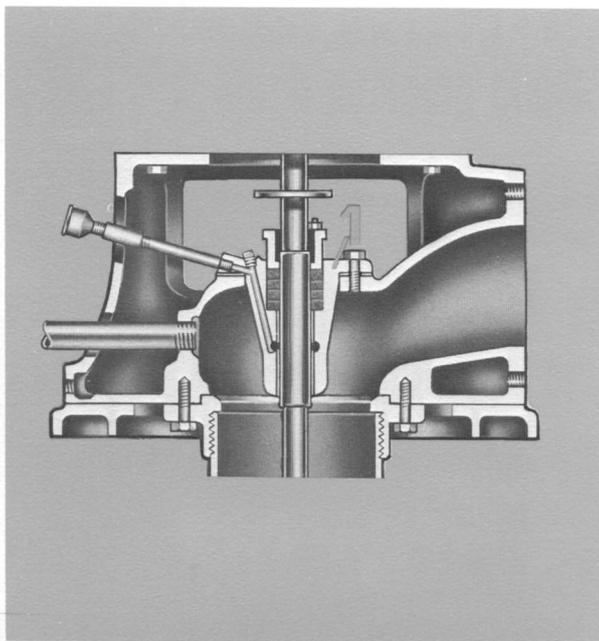
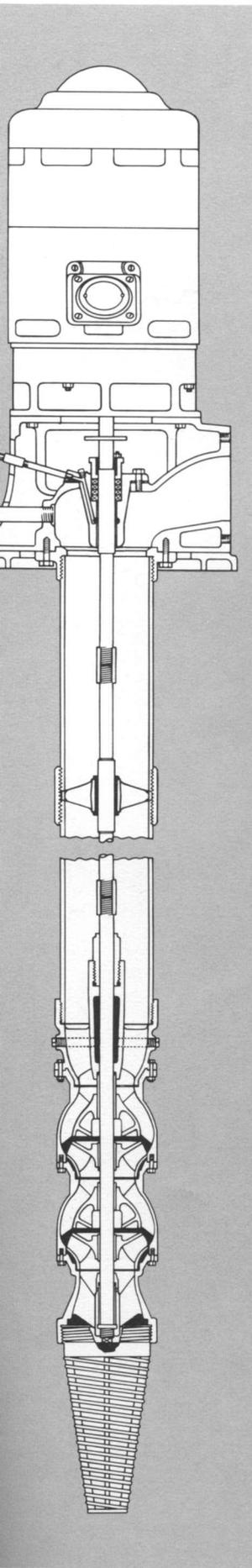
F/M 7000 . . . higher peak efficiency over a wider capacity range with real savings in power costs!

Ask your Fairbanks-Morse sales representative for a curve on pump bowl performance of the F/M 7000 pump for your application.

You may be pleasantly surprised how soon the F/M 7000 will pay for itself.

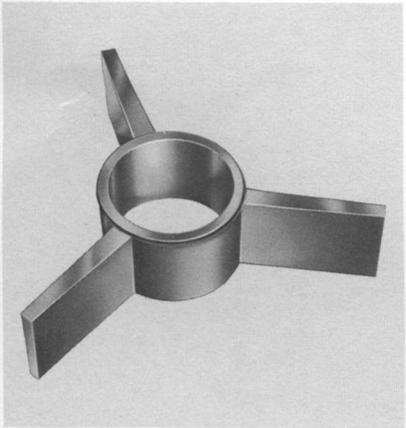
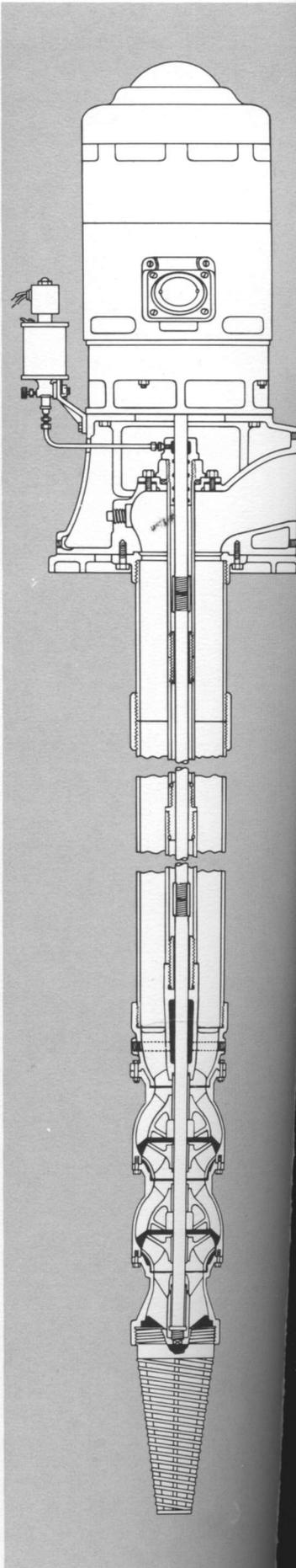
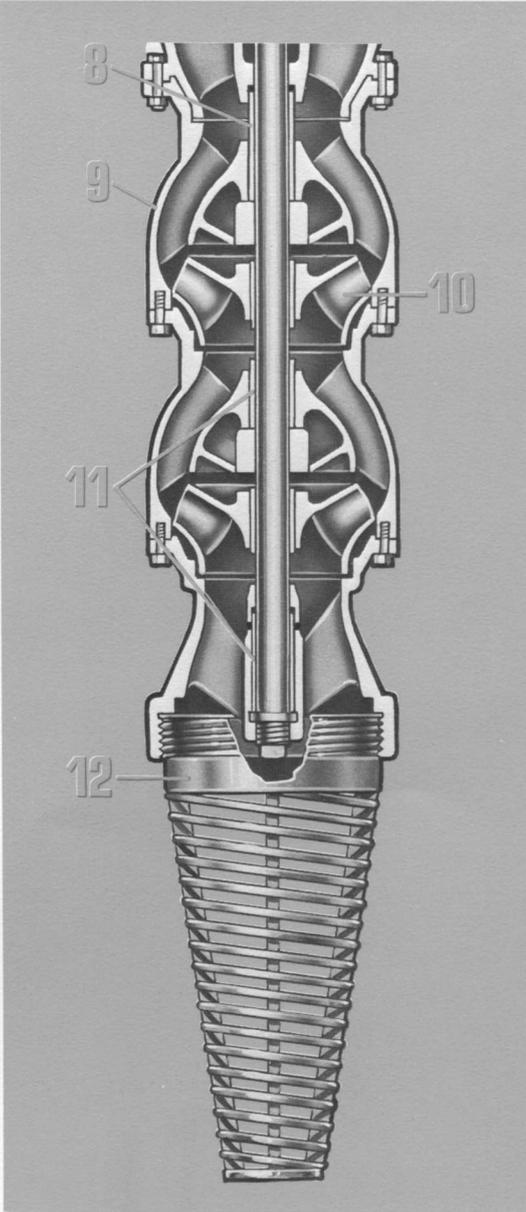
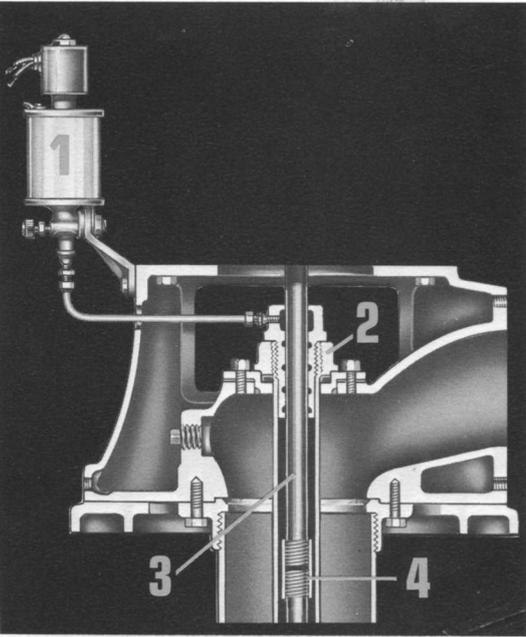
**The Fairbanks Morse
7000 with water-
lubricated
line shaft bearings**



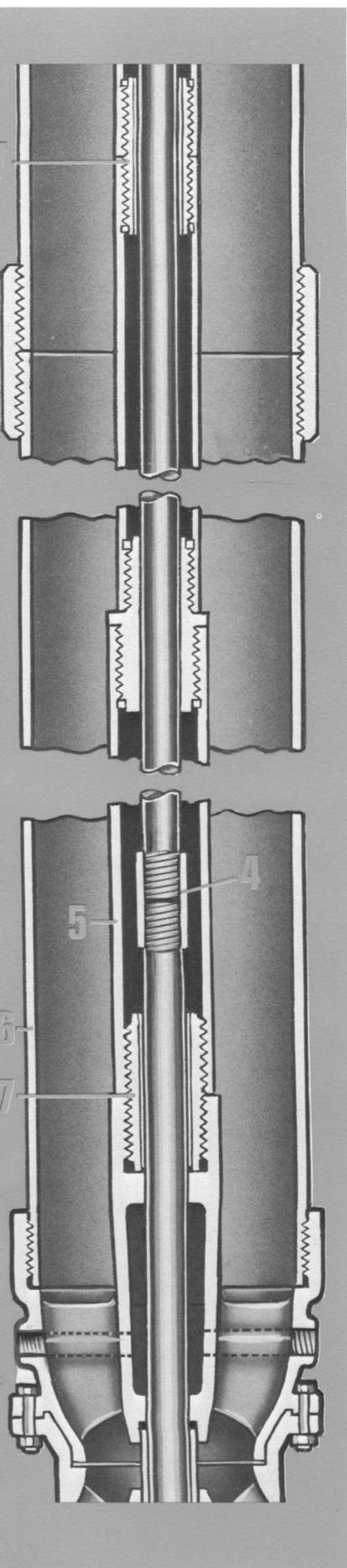


- 1 PACKING BOX** . . . located at surface for easy accessibility for inspection and servicing.
- 2 DRIVE SHAFT** . . . high-strength steel with replaceable stainless steel sleeve provides corrosion-resistance at every bearing . . . manufactured to exact standards so necessary for vibration-free operation and long pump life.
- 3 SHAFT COUPLINGS** . . . high-strength steel . . . accurately-machined from bar stock.
- 4 LINE SHAFT BEARINGS** . . . water-lubricated . . . abrasion-resistant rubber . . . flanged ends to assure firm positioning in the retainer.
- 5 BEARING RETAINERS** . . . bronze . . . streamlined for minimum friction loss.
- 6 BOWL BEARINGS** . . . bronze . . . water-lubricated . . . specifically designed for long life . . . each intermediate stage fitted with bearing . . . extra-long bearings used in suction and discharge bowls to assure adequate support for impeller shaft . . . suction bearing grease-packed at factory.
- 7 PUMP SHAFT** . . . high-strength stainless steel . . . in combination with bronze bearings provides corrosion-resistance in vital pump area.
- 8 COLUMN PIPE** . . . heavy wall steel . . . cut to exact lengths to assure matchup with rotating parts . . . special threading to minimize reduction in wall thickness and assure square butting of each section in its coupling . . . couplings made from extra strong seamless steel tubing.
- 9 PUMP BOWLS** . . . high-tensile cast iron . . . water passages coated with rock-hard glass enamel to provide greater corrosion-resistance and reduce buildup of foreign matter than could cause lockup during pump shutdown.
- 10 ENCLOSED IMPELLERS** . . . bronze . . . locked securely on stainless steel impeller shaft to assure accurate adjustment of each impeller . . . no keys required . . . close running clearance maintained between impeller and pump bowl . . . extra-long L-shaped seal surface provides both side and end seal to cut down water bypass and maintain high pump efficiency.
- 11 SUCTION PIPE** . . . machined from discharge column stock . . . may be coupled to galvanized or bronze cornucopia-type strainer which prevents large particles from entering pump.

**The Fairbanks Morse
7000 with oil-
lubricated
line shaft bearings**

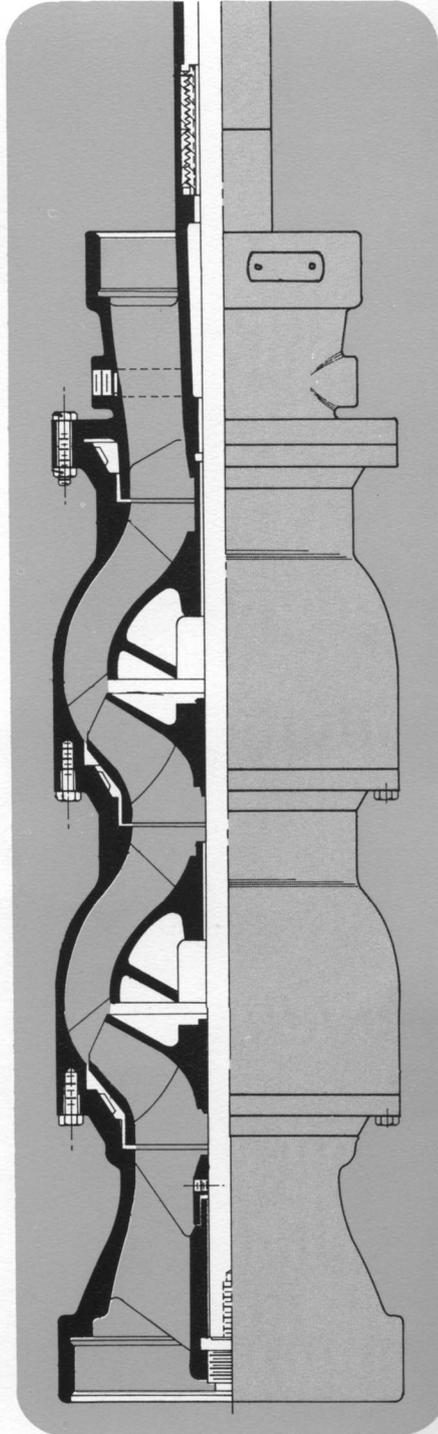
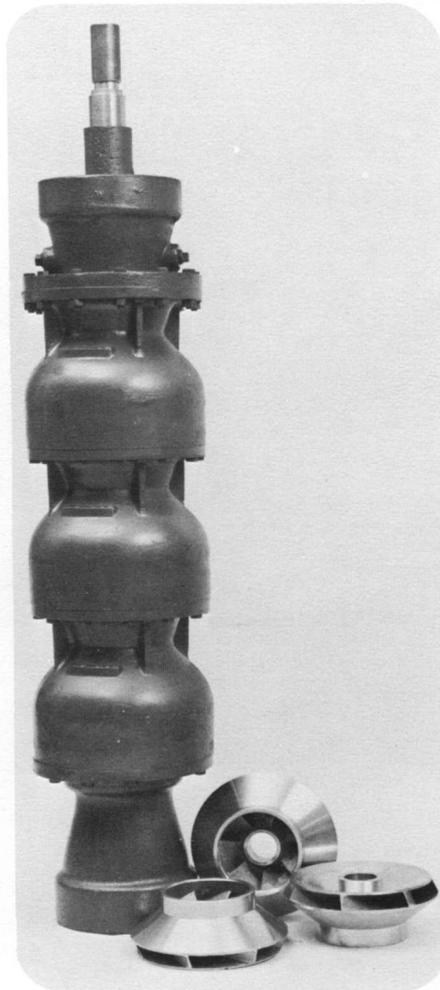


13



- 1 LUBRICATION** . . . solenoid oiler feeds predetermined quantity of oil into top of shaft tube when pump is operating.
- 2 SHAFT TUBE TENSION NUT** . . . functions as seal at pump head . . . no stuffing box required for pump shaft . . . shaft tube cap (tapped for oil line) seals shaft tube against oil leakage.
- 3 DRIVE SHAFT** . . . high-strength steel . . . manufactured to exact standards so necessary for vibration-free operation and long pump life.
- 4 SHAFT COUPLINGS** . . . high-strength steel . . . accurately machined from bar stock.
- 5 SHAFT ENCLOSING TUBE** . . . extra heavy steel pipe . . . encloses drive shaft from pump bowl discharge connection to pump head . . . top end extends through head and is held securely by tension nut.
- 6 COLUMN PIPE** . . . heavy wall steel . . . cut to exact lengths to assure matchup with rotating parts . . . special threading to minimize reduction in wall thickness and assure square butting of each section in its coupling . . . couplings made from extra strong seamless steel tubing.
- 7 BEARINGS** . . . bronze . . . carefully finished to provide smooth bearing surface for drive shaft . . . outside uniformly threaded to provide rigid coupling for shaft tube.
- 8 TOP BEARING** . . . bronze . . . separated by relief port into two sections . . . port opens into well to drain any leakage from pump bowls through running clearance in lower section of top bearing.
- 9 PUMP BOWLS** . . . high-tensile cast iron . . . water passages coated with rock-hard glass enamel to provide greater corrosion-resistance and reduce buildup of foreign matter that could cause lockup during pump shutdown.
- 10 ENCLOSED IMPELLERS** . . . bronze . . . locked securely on stainless steel impeller shaft to assure accurate adjustment of each impeller . . . no keys required . . . close running clearance maintained between impeller and pump bowl . . . extra-long L-shaped seal surface provides both side and end seal to cut down water bypass and maintain high pump efficiency.
- 11 BOWL BEARINGS** . . . bronze . . . water-lubricated . . . specifically designed for long life . . . each intermediate stage fitted with bearing . . . extra-long bearings used in suction and discharge bowls to assure adequate support for impeller shaft . . . suction bearing grease-packed at factory.
- 12 SUCTION PIPE** . . . machined from discharge column stock . . . may be coupled to galvanized or bronze cornucopia-type strainer which prevents large particles from entering pump.
- 13 CENTERING RETAINER** . . . high quality natural rubber specifically designed for long life . . . holds shaft enclosing tube straight and rigid at all times.

New streamlined impeller/bowl design with improved flow characteristics, higher quality materials, smoother surfaces keeps efficiency high . . . season after season!



How To Buy The F/M 7000...

You can save time and money by giving your Fairbanks Morse sales representative the following information at one time. He will then be able to select the proper pump for your specific service and give you a quotation promptly.

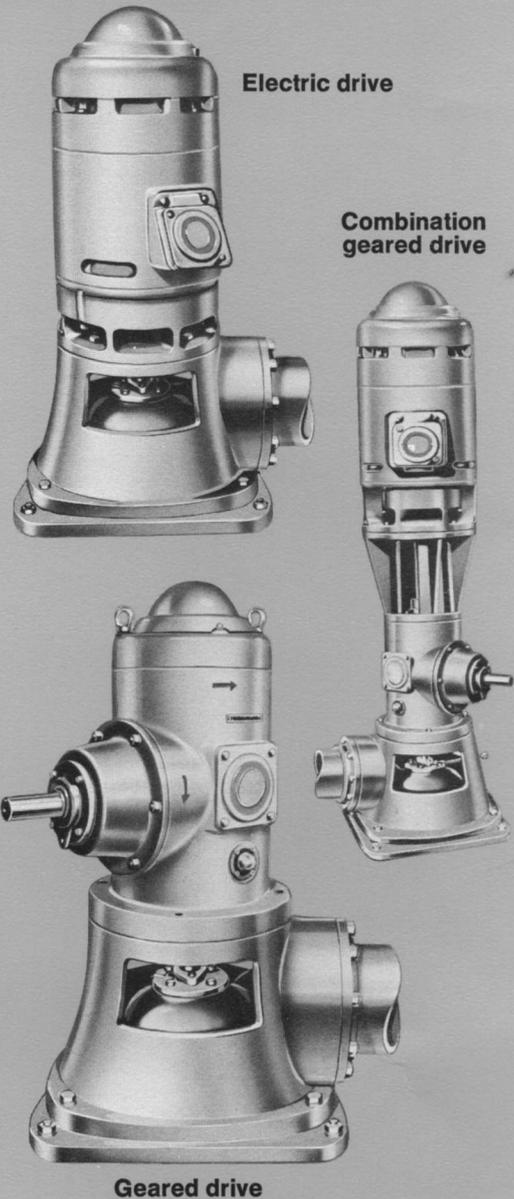
- 1 Inside diameter of well.
- 2 Depth of well.
- 3 Depth to water when pumping.
- 4 Draw-down when pumping desired capacity.
- 5 Capacity required in GPM.
- 6 Pressure required at discharge head.
- 7 Type of drive you plan to use.
- 8 If well is not straight or diameter is not true for entire length, describe condition in detail. Make sketch.

Your Fairbanks Morse Sales Representative —

Discharge Heads

Discharge heads for all Fairbanks Morse vertical turbine pumps are designed to accommodate electric motors, gear drives or other drivers . . . whatever is required by the local power supply.

Here are three typical discharge heads and drivers:



Colt Industries



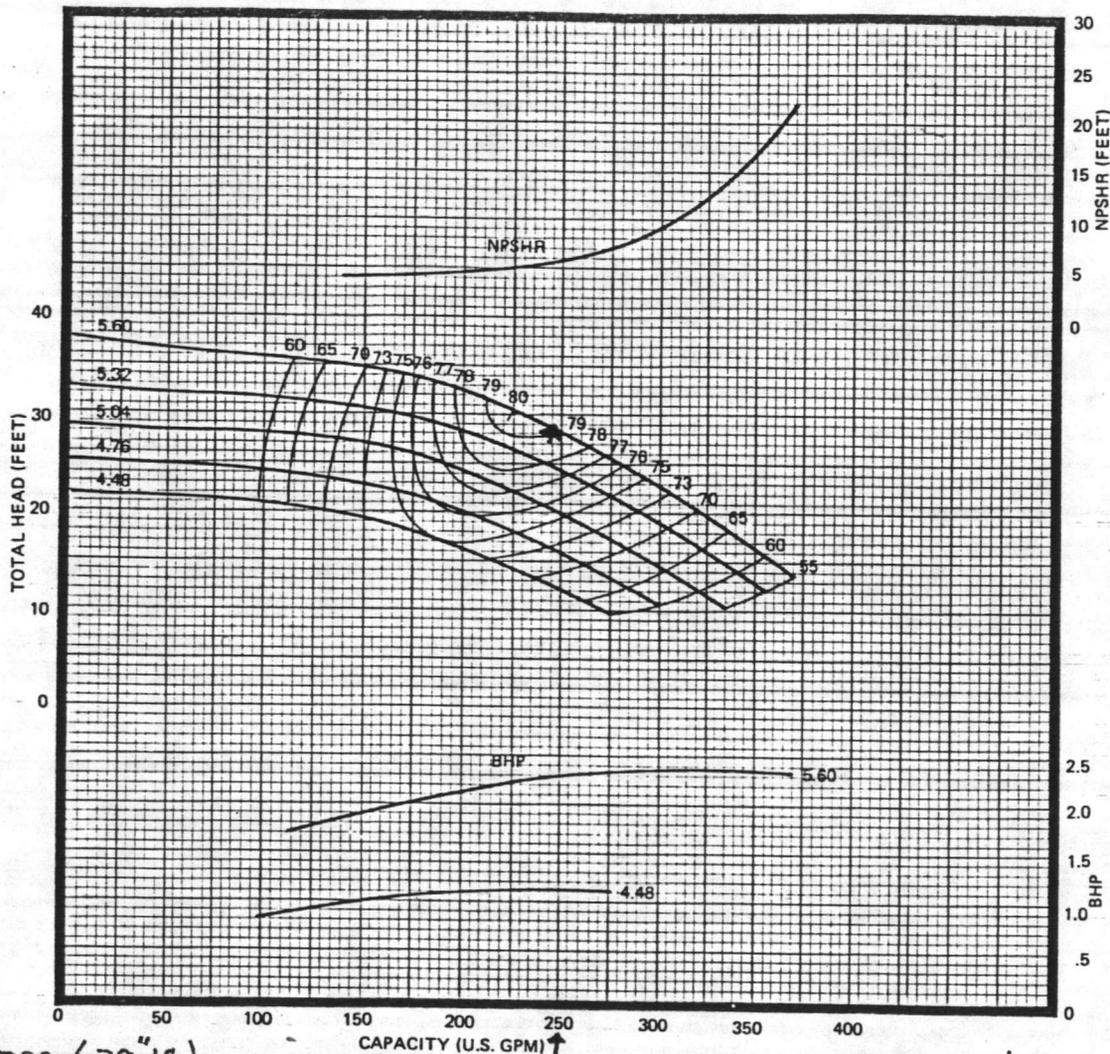
Fairbanks Morse Pump Division

3601 Kansas Avenue • Kansas City, KS 66110

VERTICAL TURBINE PUMPS SINGLE STAGE PERFORMANCE

8M
7000
1770
RPM

IMPELLER
T7CA92



250 GPM @ 85' TDH 1770 RPM

EFFICIENCY CORRECTIONS (1)

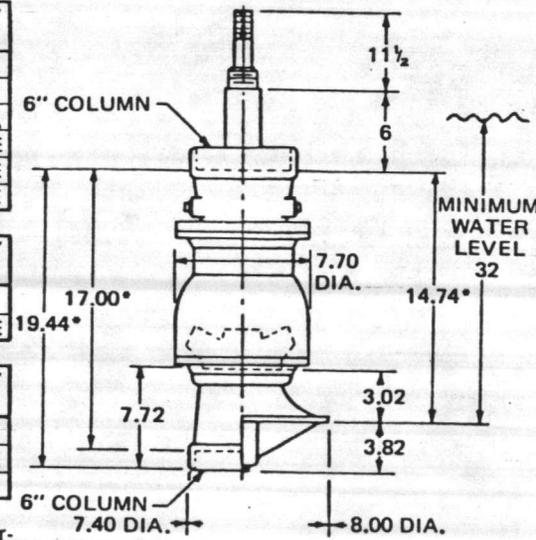
NUMBER OF STAGES	EFFICIENCY CHANGE
1	-7.0 POINTS
2	-3.0 POINTS
3	-1.0 POINTS
4	NO CHANGE
5	NO CHANGE
6 OR MORE	NO CHANGE

BOWL MATERIAL	EFFICIENCY CHANGE
CAST IRON	-2.0 POINTS
ENAMELED C.I.	NO CHANGE

IMPELLER MATERIAL	EFFICIENCY CHANGE
CAST IRON	-1.0 POINTS
BRONZE	NO CHANGE
ENAMELED C.I.	NO CHANGE

(1) Refer to "Application and Reference Data" for head correction.

DIMENSIONS (Inches)

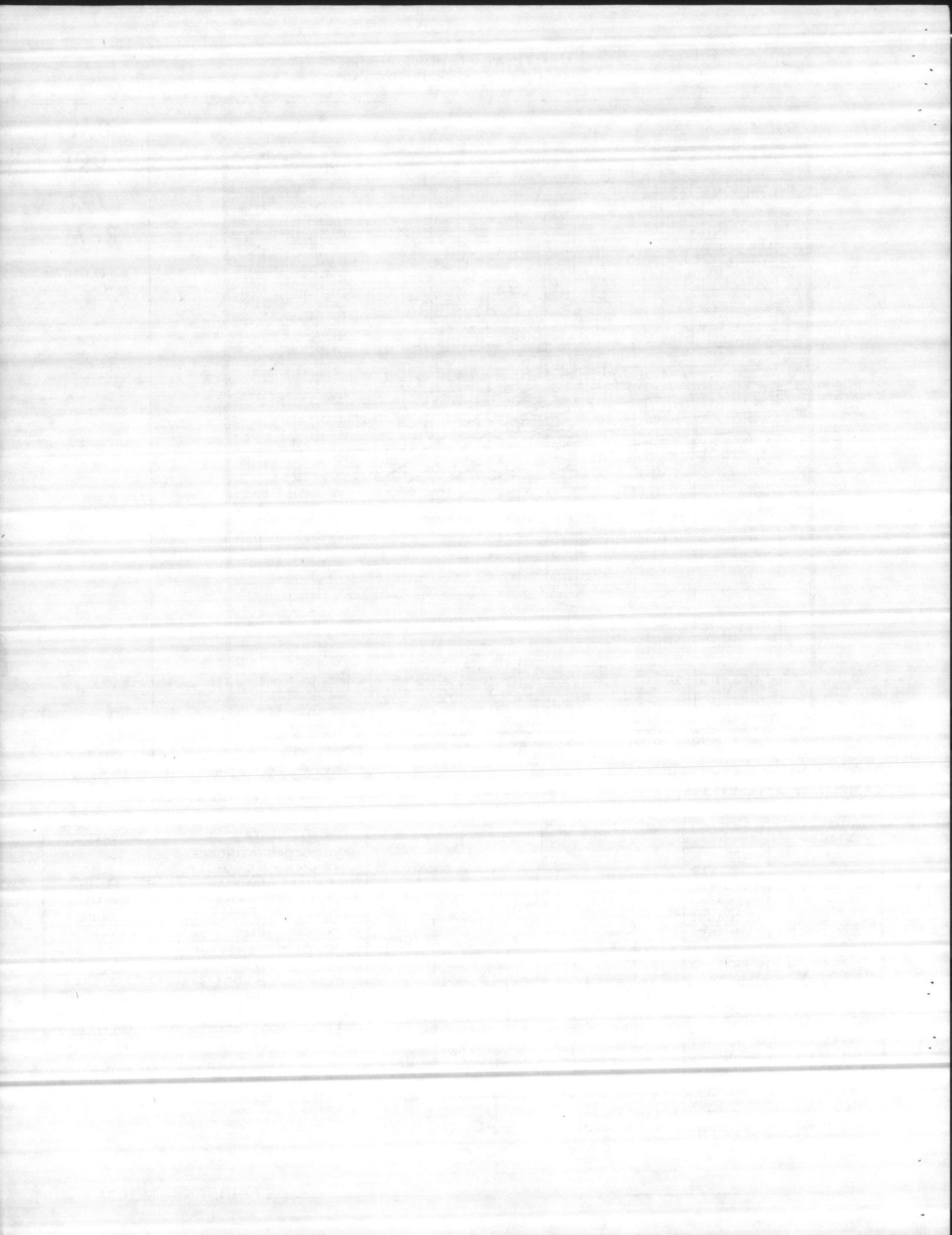


*Add 6.58 for each additional stage.

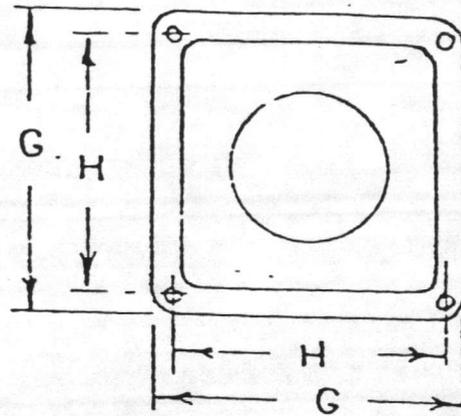
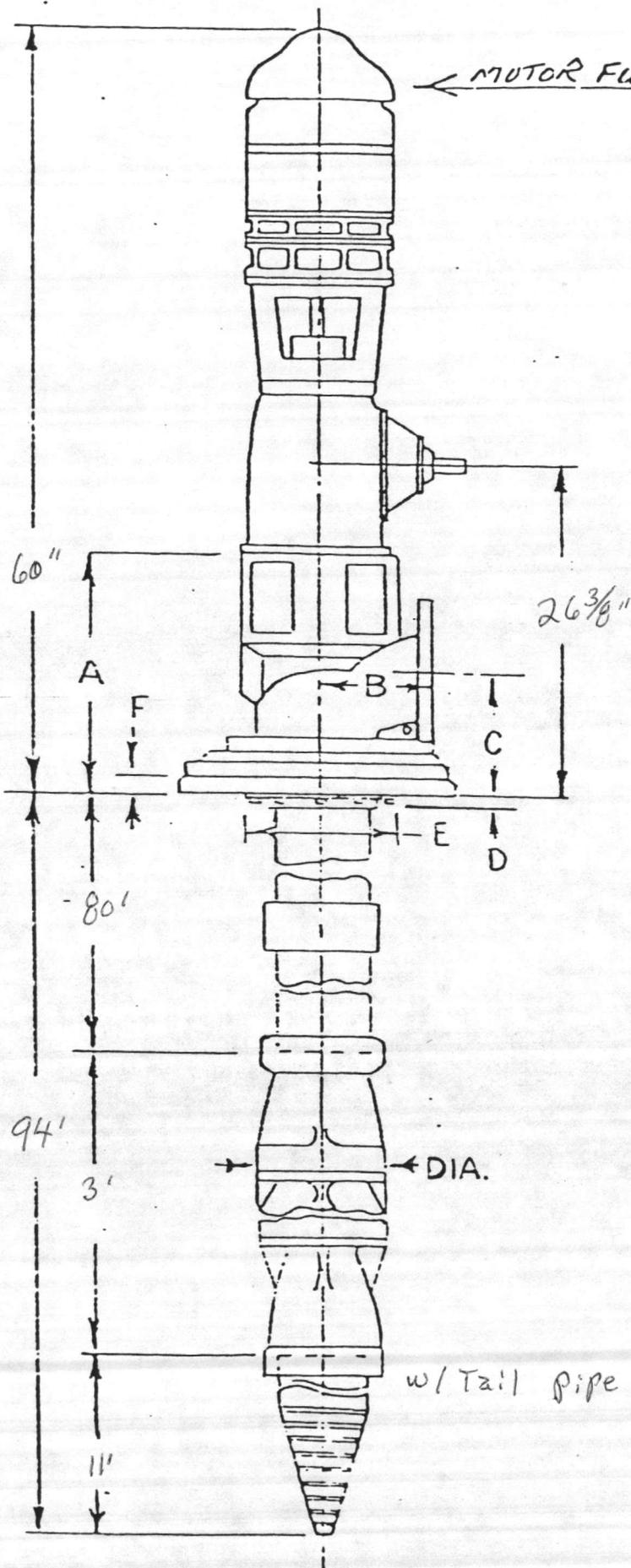
TECHNICAL DATA

DATA	VALUE
MAXIMUM OPERATING SPEED	3600 RPM
MAXIMUM NUMBER OF STAGES	32**
PUMP SHAFT DIAMETER	1 1/8 IN.
IMPELLER EYE AREA	6.93 SQ. IN.
MAXIMUM SPHERE SIZE	.56 IN.
K _t (THRUST FACTOR)	4.15 LBS./FT.
K _a (ROTOR WT. PER STAGE)	5.25 LBS.
BOWL WT. (FIRST STAGE)	82 LBS.
BOWL WT. (EACH ADD'L. STAGE)	31 LBS.
ALLOWABLE SHAFT STRETCH	.39 IN.**
WK ² (FIRST STAGE)	.17 LBS.-FT. ²
WK ² (EACH ADD'L. STAGE)	.16 LBS.-FT. ²
BOWL RING CLEARANCE	.014/.018 IN.

**These are nominal values. Refer to "Application and Reference Data" for information further limiting or extending these values.

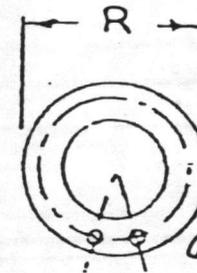


MOTOR FURNISHED BY E.P.I.



4-K-DIA HOLES

BASEPLATE TOP VIEW



6" Discharge Flange

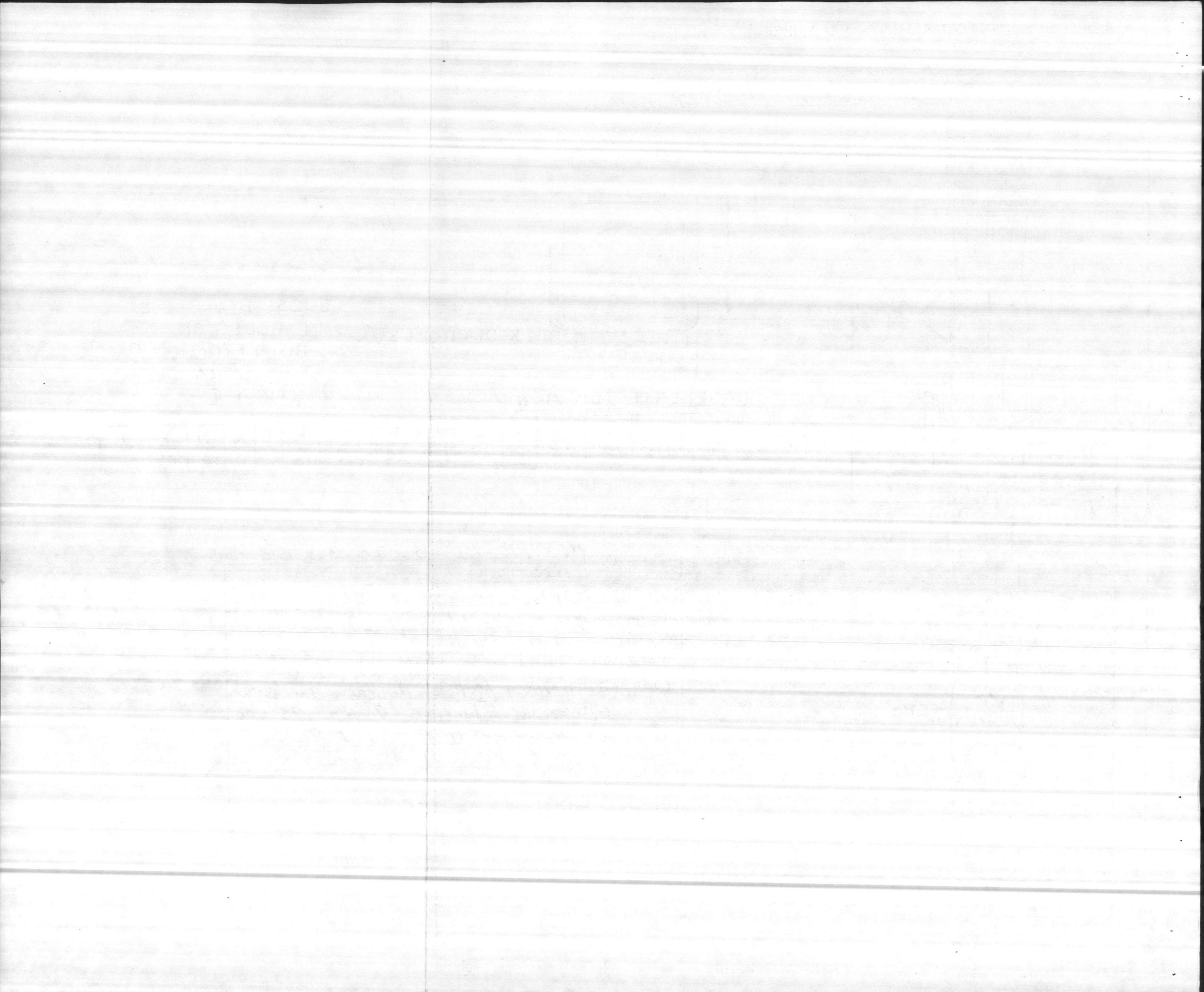
L-125 LB ANSI FLG
M-N-HOLES ON
P-BOLT CIRCLE
HOLES STRADDLE
VERTICAL C

HEAD	A	B	C	D	E	F	G	H	K	L	M	N	P	R
16 1/2" X 6" "D"	2 1/2"	10"	9 3/8"	7/8"	14 3/4"	1 1/2"	24"	21	7/8"	8	7/8"	9 1/2"	11	

N62470-80-B-2053 - Bld. 1005

CERTIFICATION FOR			
CUSTOMER	HARRIS Electric	PC#	
JOB NAME & LOCATION	Rebuild Well - CAMP LeJeune		
CONSULTING ENGINEERS	Public Works Dept.		
PUMP CONDITIONS	250 GPM	85' TDH	1770 RPM 80 SETTING
PUMP	Fairbanks-Morse	4 Stage	8M Fig. 7000
MOTOR	General Electric	7 1/2 Hp.	VHS-NRC
GEAR	Johnson	CH 20	1:1 Ratio
COLUMN & SHAFT	6" Galv.	1"	416 S.S
SUCTION PIPE	6" Galv.		
STRAINER	Cone	6" Galv	
CERTIFIED BY	R.M.W.	DATE	11-12-80 SCALE - NONE

ENVIRONMENTAL PRODUCTS, INCORPORATED
HICKORY, NORTH CAROLINA



INDUCTION MOTORS—INTEGRAL-HP, 3- AND 2-PHASE

VERTICAL • SQUIRREL-CAGE

TRI/CLAD • Hollow-shaft • Weather Protected

(NEMA Type I)

GEM-2562E

High-thrust

Normal-starting-torque

NEMA Type P Base

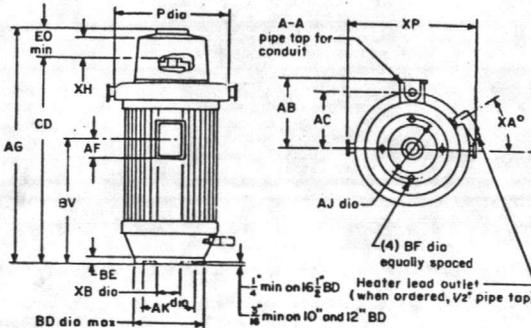
Type K

Frames L213TP to C404TP, 3600 Rpm and Below

Self-release, Bolted or Nonreverse Coupling

Feb. 20, 1978

DIMENSIONS—For ESTIMATING ONLY unless endorsed for construction.



For 3000- and 3600-RPM MOTORS ONLY

For a given pump shaft diameter the following table gives the maximum distance between the motors top coupling and the pump's first line shaft bearing. This table is based on keeping the headshaft critical at least 25 percent above operating speed. The selection of a smaller headshaft diameter may make it necessary to support the headshaft in a close-fitting bushing in the lower end of the motor shaft.

Pump Shaft Diameter in Inches	Maximum Distance Between Top Coupling and Lower Support in Inches
0.750	33
1.000	38
1.187	42
1.437	45
1.500	47
1.688	50

Frame No.	Approx Net Wt in Lb	Dimensions in Inches																	
		CD	P	AA	AB	AC	AF	AG	AJ	AK	BD	BE	BF	BV	EO	XA°	XB	XH	XP
L213TP10	130	18 3/8	13 1/4	1	9 3/8	7 3/8	4	22 1/2	9 1/2	8 1/4	10	3/4	3/8	8 3/8	2 3/4	55	3 1/2	2	14 1/4
L213TP12	140	18 3/8	13 3/4	1	9 3/8	7 3/8	4	22 1/2	9 1/2	8 1/4	10	3/4	3/8	8 3/8	2 3/4	55	3 1/2	2	14 1/4
L254TP10	205	23 3/8	15 1/2	1 1/4	10 3/8	8 3/8	4	26 3/4	9 1/2	8 1/4	10	3/4	3/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
L254TP12	225	23 3/8	15 3/4	1 1/4	10 3/8	8 3/8	4	26 3/4	9 1/2	8 1/4	10	3/4	3/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
L254TP12	215	23 3/8	15 1/2	1 1/4	10 3/8	8 3/8	4	26 3/4	9 1/2	8 1/4	12	3/4	3/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
L256TP12	235	23 3/8	15 3/4	1 1/4	10 3/8	8 3/8	4	26 3/4	9 1/2	8 1/4	12	3/4	3/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
L256TP12	235	23 3/8	15 3/4	1 1/4	10 3/8	8 3/8	4	26 3/4	9 1/2	8 1/4	12	3/4	3/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
L254TP16	235	23 3/8	15 3/4	1 1/4	10 3/8	8 3/8	4	26 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
L256TP16	255	23 3/8	15 3/4	1 1/4	10 3/8	8 3/8	4	26 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	10 3/8	2 3/4	45	3 1/2	2	17 1/4
D284TP10	260	23	16	1 1/2	11	8 1/2	4	27 1/2	9 1/2	8 1/4	10	3/4	3/8	10 3/8	4	33	3 1/2	2	17 1/4
D284TP12	265	23	16	1 1/2	11	8 1/2	4	27 1/2	9 1/2	8 1/4	12	3/4	3/8	12 1/8	4	33	3 1/2	3 1/4	18
D284TPH16	275	23	16	1 1/2	11	8 1/2	4	27 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/8	12 1/8	4	33	3 1/2	3 1/4	18
C284TP10	280	23 3/4	16	1 1/2	11	8 1/2	4	28 1/2	9 1/2	8 1/4	10	3/4	3/8	13 1/8	4	33	3 1/2	3 1/4	18
C284TP10	280	23 3/4	16	1 1/2	11	8 1/2	4	28 1/2	9 1/2	8 1/4	10	3/4	3/8	13 1/8	4	33	3 1/2	3 1/4	18
C284TP12	285	23 3/4	16	1 1/2	11	8 1/2	4	28 1/2	9 1/2	8 1/4	12	3/4	3/8	13 1/8	4	33	3 1/2	3 1/4	18
C284TPH16	295	23 3/4	16	1 1/2	11	8 1/2	4	28 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/8	13 1/8	4	33	3 1/2	3 1/4	18
C284TPH16	295	23 3/4	16	1 1/2	11	8 1/2	4	28 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/8	13 1/8	4	33	3 1/2	3 1/4	18
C284TPH16	305	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	9 1/2	8 1/4	10	3/4	3/8	14 1/8	4	33	3 1/2	3 1/4	18
C284TPH16	305	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	9 1/2	8 1/4	10	3/4	3/8	14 1/8	4	33	3 1/2	3 1/4	18
C286TP10	305	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	9 1/2	8 1/4	10	3/4	3/8	14 1/8	4	33	3 1/2	3 1/4	18
K284TP12	310	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	9 1/2	8 1/4	12	3/4	3/8	14 1/8	4	33	3 1/2	3 1/4	18
K286TP12	310	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	9 1/2	8 1/4	12	3/4	3/8	14 1/8	4	33	3 1/2	3 1/4	18
K284TPH16	320	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	14 1/8	4	33	3 1/2	3 1/4	18
K286TPH16	320	24 3/4	16	1 1/2	11	8 1/2	4	29 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	14 1/8	4	33	3 1/2	3 1/4	18
D286TP10	330	25 3/4	16	1 1/2	11	8 1/2	4	30 3/4	9 1/2	8 1/4	10	3/4	3/8	15 1/8	4	33	3 1/2	3 1/4	18
D286TP12	335	25 3/4	16	1 1/2	11	8 1/2	4	30 3/4	9 1/2	8 1/4	10	3/4	3/8	15 1/8	4	33	3 1/2	3 1/4	18
D286TPH16	345	25 3/4	16	1 1/2	11	8 1/2	4	30 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	15 1/8	4	33	3 1/2	3 1/4	18
C324TP16	390	30 3/8	16	2	12 1/2	9 1/4	4 3/8	35 1/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	17 3/8	4 1/2	33	3 1/2	3 1/2	18
C324TPH12	380	30 3/8	16	2	12 1/2	9 1/4	4 3/8	35 1/4	9 1/2	8 1/4	12	3/4	3/8	17 3/8	4 1/2	33	3 1/2	3 1/2	18
C326TP16	445	32 1/8	16	2	12 1/2	9 1/4	4 3/8	37 1/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	20 1/8	4 1/2	33	3 1/2	3 1/2	18
C326TPH12	435	32 1/8	16	2	12 1/2	9 1/4	4 3/8	37 1/4	9 1/2	8 1/4	12	3/4	3/8	20 1/8	4 1/2	33	3 1/2	3 1/2	18
D324TP16	500	32 1/8	20	2	13 1/2	10 1/8	4 3/8	38	14 3/4	13 1/2	16 1/2	3/4	1 1/8	17 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
K326TP16	500	32 1/8	20	2	13 1/2	10 1/8	4 3/8	38	14 3/4	13 1/2	16 1/2	3/4	1 1/8	17 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
D324TPH12	475	32 1/8	20	2	13 1/2	10 1/8	4 3/8	38	9 1/2	8 1/4	12	3/4	3/8	17 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
K326TPH12	475	32 1/8	20	2	13 1/2	10 1/8	4 3/8	38	9 1/2	8 1/4	12	3/4	3/8	17 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
K324TP16	540	33 1/8	20	2	13 1/2	10 1/8	4 3/8	39	14 3/4	13 1/2	16 1/2	3/4	1 1/8	18 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
D326TP16	540	33 1/8	20	2	13 1/2	10 1/8	4 3/8	39	14 3/4	13 1/2	16 1/2	3/4	1 1/8	18 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
D364TP16	540	33 1/8	20	3	14 1/8	11 3/8	6 3/8	39	14 3/4	13 1/2	16 1/2	3/4	1 1/8	18 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
K324TPH12	515	33 1/8	20	2	13 1/2	10 1/8	4 3/8	39	9 1/2	8 1/4	12	3/4	3/8	18 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
D326TPH12	515	33 1/8	20	2	13 1/2	10 1/8	4 3/8	39	9 1/2	8 1/4	12	3/4	3/8	18 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
D364TP12	515	33 1/8	20	3	14 1/8	11 3/8	6 3/8	39	9 1/2	8 1/4	12	3/4	3/8	18 1/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
C364TP16	590	35 1/8	20	3	14 1/8	11 3/8	6 3/8	40 1/4	14 3/4	13 1/2	16 1/2	3/4	1 1/8	19 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
C364TP12	565	35 1/8	20	3	14 1/8	11 3/8	6 3/8	40 1/4	9 1/2	8 1/4	12	3/4	3/8	19 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
K364TP16	650	36 1/8	20	3	14 1/8	11 3/8	6 3/8	41 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/8	20 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
C365TP16	650	36 1/8	20	3	14 1/8	11 3/8	6 3/8	41 1/2	9 1/2	8 1/4	12	3/4	3/8	20 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
K364TP12	625	36 1/8	20	3	14 1/8	11 3/8	6 3/8	41 1/2	9 1/2	8 1/4	12	3/4	3/8	20 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
C365TP12	625	36 1/8	20	3	14 1/8	11 3/8	6 3/8	41 1/2	9 1/2	8 1/4	12	3/4	3/8	20 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
D365TP16	730	38 3/8	20	3	14 1/8	11 3/8	6 3/8	43 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/8	22 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4
C404TP16	730	38 3/8	20	3	14 1/8	11 3/8	6 3/8	43 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/8	22 3/8	4 1/2	22 1/2	4 1/2	3 1/2	22 3/4

THE FRAME NUMBERS SHOWN IN BOLD FACE TYPE INDICATE STANDARD NEMA BASE SIZES

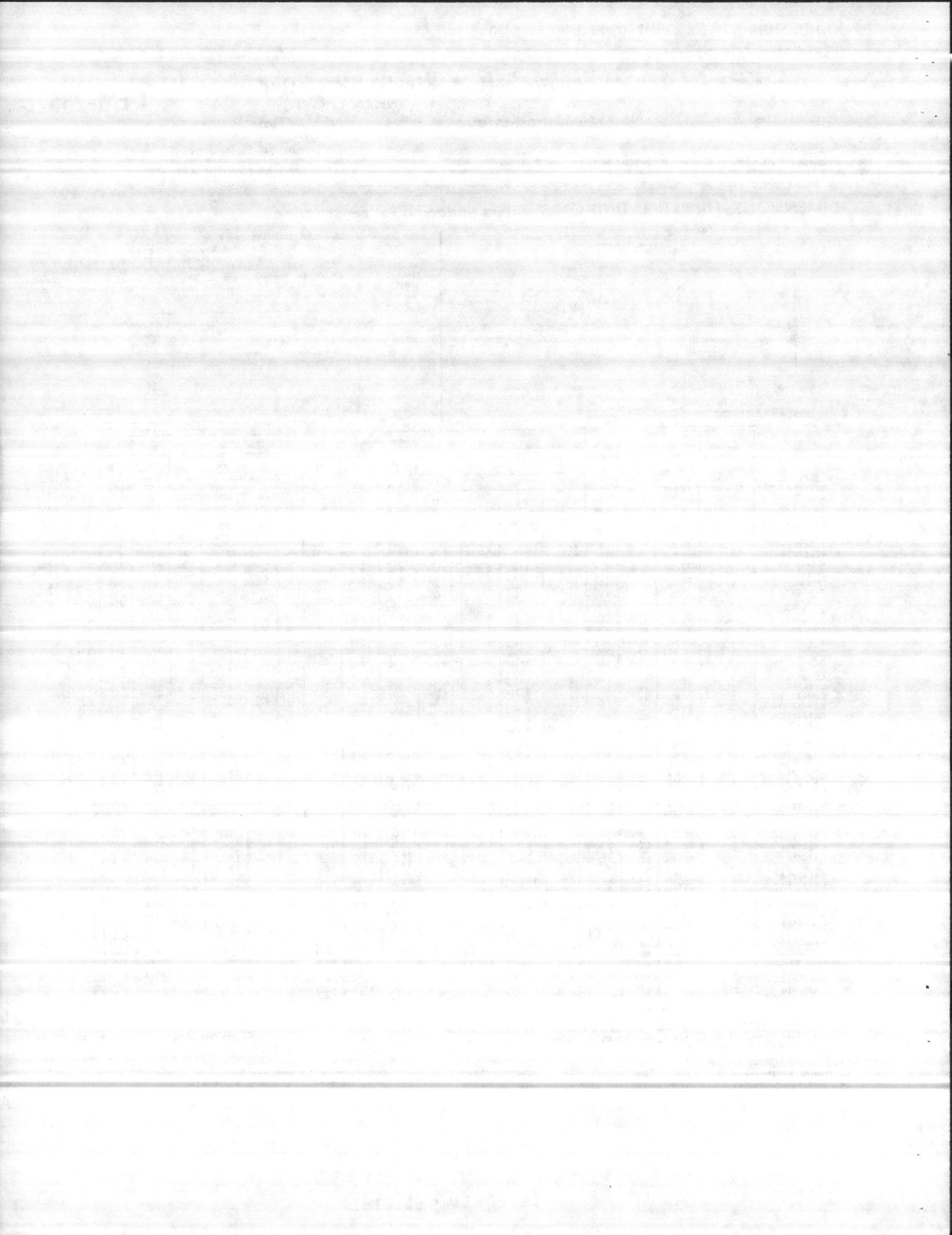
* The total height of pump shaft and locking nut above top of coupling must not exceed dimension XH.

NOTES:

Provided mounting conditions permit, diagonally split conduit box may be turned so that entrance can be made from the bottom, or either side. Frames L213 through D286 have grease-lubricated upper guide and lower thrust bearings. Frames C324 through C404 have oil-lubricated upper

thrust and grease-lubricated lower guide bearings. Oil sight gage, filler plug and drain plug are located on opposite side of motor from conduit box.

Tolerances: Face runout and permissible eccentricity of mounting rabbet—
For "AK" dimension 8 1/4 inches, 0.004 TIR.
For "AK" dimension 13 1/2 inches, 0.007 TIR.
For shipping weight add 5 per cent to net weights.



Johnson Right Angle Gear Drive

These features mean continuous on-stream performance,
low maintenance and dependability

NON-REVERSE
COUPLING,
standard on hollow-
shaft drives

high tensile strength
cast iron HOUSING

quick visual inspection
of gear lubrication with
OIL SIGHT WINDOW
(not shown)

HOLLOW OR SOLID
SHAFT

externally mounted OIL
COOLER with top and
bottom cooling water
connections

weatherproof light weight
COVER

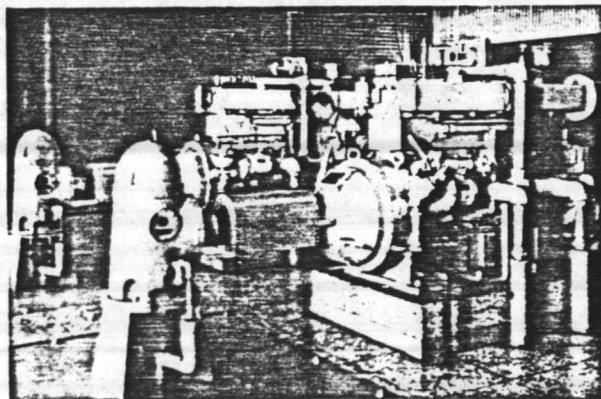
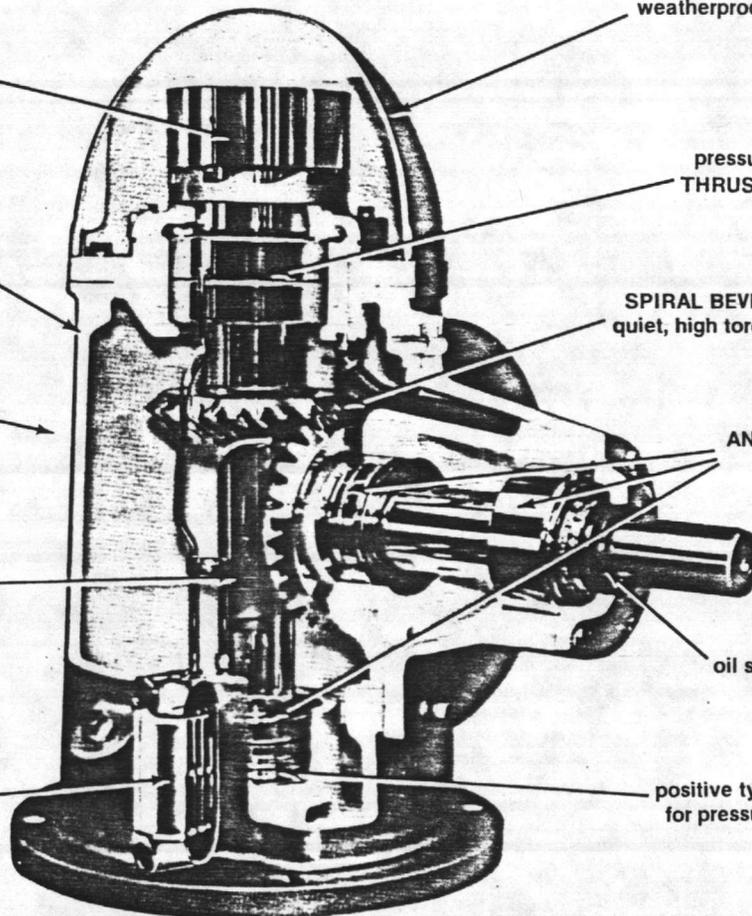
pressure-lubricated
THRUST BEARINGS

SPIRAL BEVEL GEARS for
quiet, high torque operation

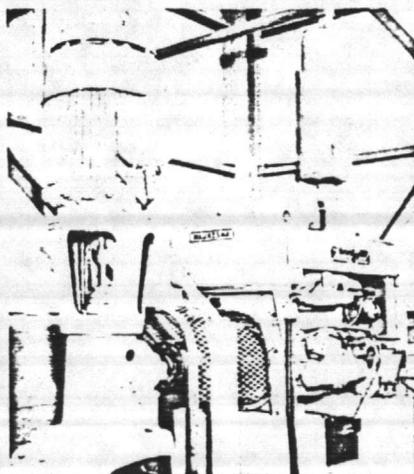
ANTI-FRICTION
BEARINGS

oil seal protection
by SLINGERS

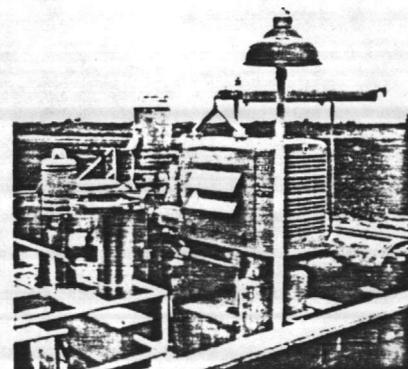
positive type OIL PUMP
for pressure lubrication
of bearings



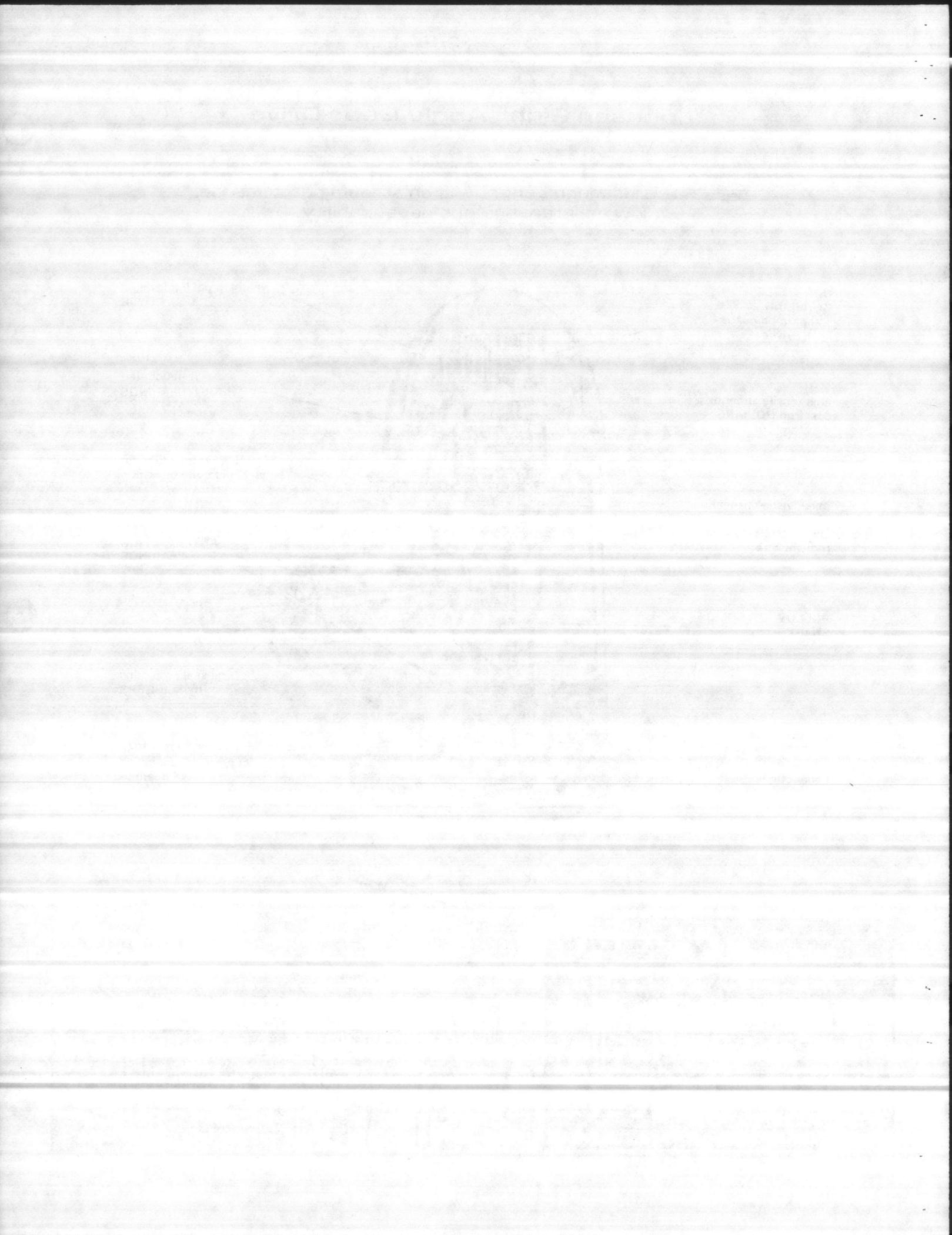
Standard right angle gear drive



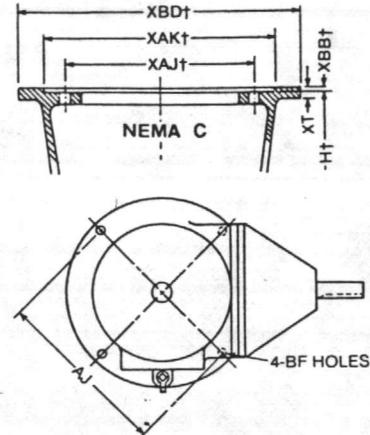
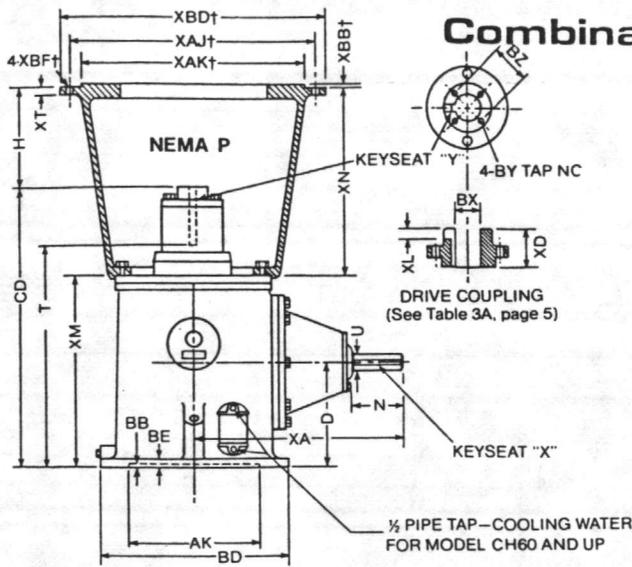
Combination Drive



Redi-Torq gear drive



Combination Drives – Hollow Shaft



Speed decreasing ratios in Models CH150 and up are subject to change in dimensions: U—XA—N—X. Contact factory for certified print.

Table 4. COMBINATION DRIVE DIMENSIONS (Hollow Shaft) in inches

Model	CD	D	U	XA	N	XM	H	BE	BD	AJ	AK	BB	BF	Keyseat X
CH20	16	6 ³ / ₁₆	1 ¹ / ₂	13	2 ³ / ₄	11 ¹ / ₄	7 ³ / ₄	5 ⁸ / ₁₆	10	9 ¹ / ₈	8 ¹ / ₄	3 ¹ / ₁₆	7 ¹ / ₁₆	1/4 x 1/8 x 2 1/4
CH40 (12)	22 ¹ / ₄	9	1 ¹ / ₂	16	3 ¹ / ₂	15 ¹ / ₄	9	3/4	12	9 ¹ / ₈	8 ¹ / ₄	3 ¹ / ₁₆	7 ¹ / ₁₆	3/8 x 7/16 x 2 3/4
CH40	22 ¹ / ₄	9	1 ¹ / ₂	16	3 ¹ / ₂	15 ¹ / ₄	9	3/4	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	3/8 x 7/16 x 2 3/4
CH60	22 ¹ / ₄	9	1 ¹ / ₂	16	3 ¹ / ₂	15 ¹ / ₄	9	3/4	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	3/8 x 7/16 x 2 3/4
CH80	22 ¹ / ₄	9	1 ⁷ / ₈	16 ¹ / ₂	3 ¹ / ₂	15 ¹ / ₄	9	3/4	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	1/2 x 1/4 x 2 3/4
CH110	26 ³ / ₄	11 ³ / ₈	2	17 ¹ / ₂	3 ¹ / ₂	19 ⁵ / ₈	9 ⁷ / ₈	1	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	1/2 x 1/4 x 2 3/4
CH125	26 ³ / ₄	11 ³ / ₈	2	17 ¹ / ₂	3 ¹ / ₂	19 ⁵ / ₈	9 ⁷ / ₈	1	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	1/2 x 1/4 x 2 3/4
CH150	31 ³ / ₄	13 ¹ / ₄	2 ⁷ / ₁₆	20 ¹ / ₂	4 ³ / ₄	23 ¹ / ₈	10 ³ / ₈	1	20	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	5/8 x 7/16 x 3 3/4
CH200	31 ³ / ₄	13 ¹ / ₄	2 ⁷ / ₁₆	20 ¹ / ₂	4 ³ / ₄	23 ¹ / ₈	10 ³ / ₈	1	20	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	5/8 x 7/16 x 3 3/4
CH280	36	15	2 ³ / ₄	24	5 ¹ / ₂	26 ³ / ₈	12 ³ / ₈	1 ¹ / ₈	20	14 ³ / ₄	13 ¹ / ₂	3 ¹ / ₁₆	1 ¹ / ₁₆	5/8 x 7/16 x 4 3/4
CH350	40 ¹ / ₂	16 ¹ / ₂	2 ³ / ₄	29	5 ¹ / ₂	29 ⁵ / ₈	12 ³ / ₈	1 ¹ / ₄	24 ¹ / ₂	22*	13 ¹ / ₂	3 ⁸ / ₁₆	1 ⁵ / ₁₆	5/8 x 7/16 x 4 3/4
CH425	41 ³ / ₄	16 ¹ / ₂	3	30	5 ³ / ₄	29 ⁵ / ₈	12 ¹ / ₈	1 ¹ / ₄	24 ¹ / ₂	22*	13 ¹ / ₂	3 ⁸ / ₁₆	1 ⁵ / ₁₆	3/4 x 3/8 x 4 3/4
CH500	41 ³ / ₄	16 ¹ / ₂	3 ¹ / ₂	31	6 ³ / ₄	29 ⁵ / ₈	12 ¹ / ₈	1 ¹ / ₄	24 ¹ / ₂	22*	13 ¹ / ₂	3 ⁸ / ₁₆	1 ⁵ / ₁₆	7/8 x 7/16 x 5 1/2
CH600	45 ³ / ₈	16 ¹ / ₂	3 ³ / ₄	33	7 ¹ / ₂	31 ⁵ / ₈	10 ¹ / ₂	1 ¹ / ₄	24 ¹ / ₂	22*	13 ¹ / ₂	3 ⁸ / ₁₆	1 ⁵ / ₁₆	7/8 x 7/16 x 5 1/2
CH750	49	19	4	36	7 ¹ / ₂	37	12	1 ¹ / ₂	30 ¹ / ₂	26	22	3 ⁸ / ₁₆	1 ⁵ / ₁₆	1 x 1/2 x 6 3/4

H as determined using maximum XN
*Also 5/8-11 Tap on 14-3/4 Bolt Circle 1" Deep

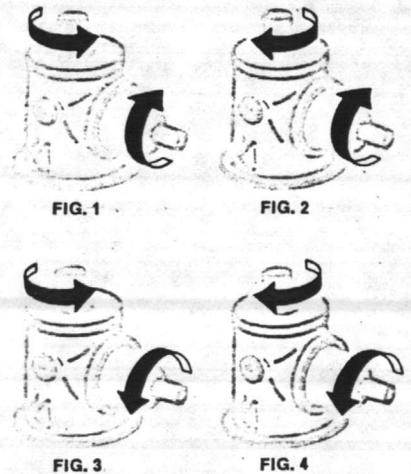
Table 4A. MAX. DRIVE COUPLING BORE SIZE AVAILABLE MOTOR STAND

Model	XD	Max. BX		T	XN Available Motor Stand		XT	Top Flange
		Fig. 1 & 4	Fig. 2 & 3					
CH20	1 ³ / ₄	1	3/4	13 ¹ / ₄	8 ¹ / ₂	10	12 ¹ / ₂	7 ¹ / ₁₆
CH40	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₄	18 ³ / ₄	12 ¹ / ₂	16		5/8
CH60	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₄	18 ³ / ₄	12 ¹ / ₂	16		5/8
CH80	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₄	18 ³ / ₄	12 ¹ / ₂	16		5/8
CH110	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₂	23	12 ¹ / ₂	17		5/8
CH125	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₂	23	12 ¹ / ₂	17		5/8
CH150	2 ³ / ₈	1 ¹⁵ / ₁₆	1 ³ / ₄	27 ¹ / ₂	15	19		3/4
CH200	2 ³ / ₈	1 ¹⁵ / ₁₆	1 ³ / ₄	27 ¹ / ₂	15	19		3/4
CH280	2 ⁵ / ₈	2	2	31 ¹ / ₂	15	22		3/4
CH350	3 ¹ / ₈	2 ³ / ₁₆	2 ³ / ₁₆	35 ¹ / ₂	15	24		1
CH425	3 ³ / ₈	2 ⁷ / ₁₆	2 ⁷ / ₁₆	35 ³ / ₄	15	24		1
CH500	3 ³ / ₈	2 ⁷ / ₁₆	2 ⁷ / ₁₆	35 ³ / ₄	15	24		1
CH600	4	2 ¹¹ / ₁₆	2 ¹¹ / ₁₆	38 ¹ / ₄	19	24		1
CH750	4	3 ³ / ₁₆	3 ³ / ₁₆	41 ³ / ₄	**	24		1 ¹ / ₄

MACHINED TO SUIT**

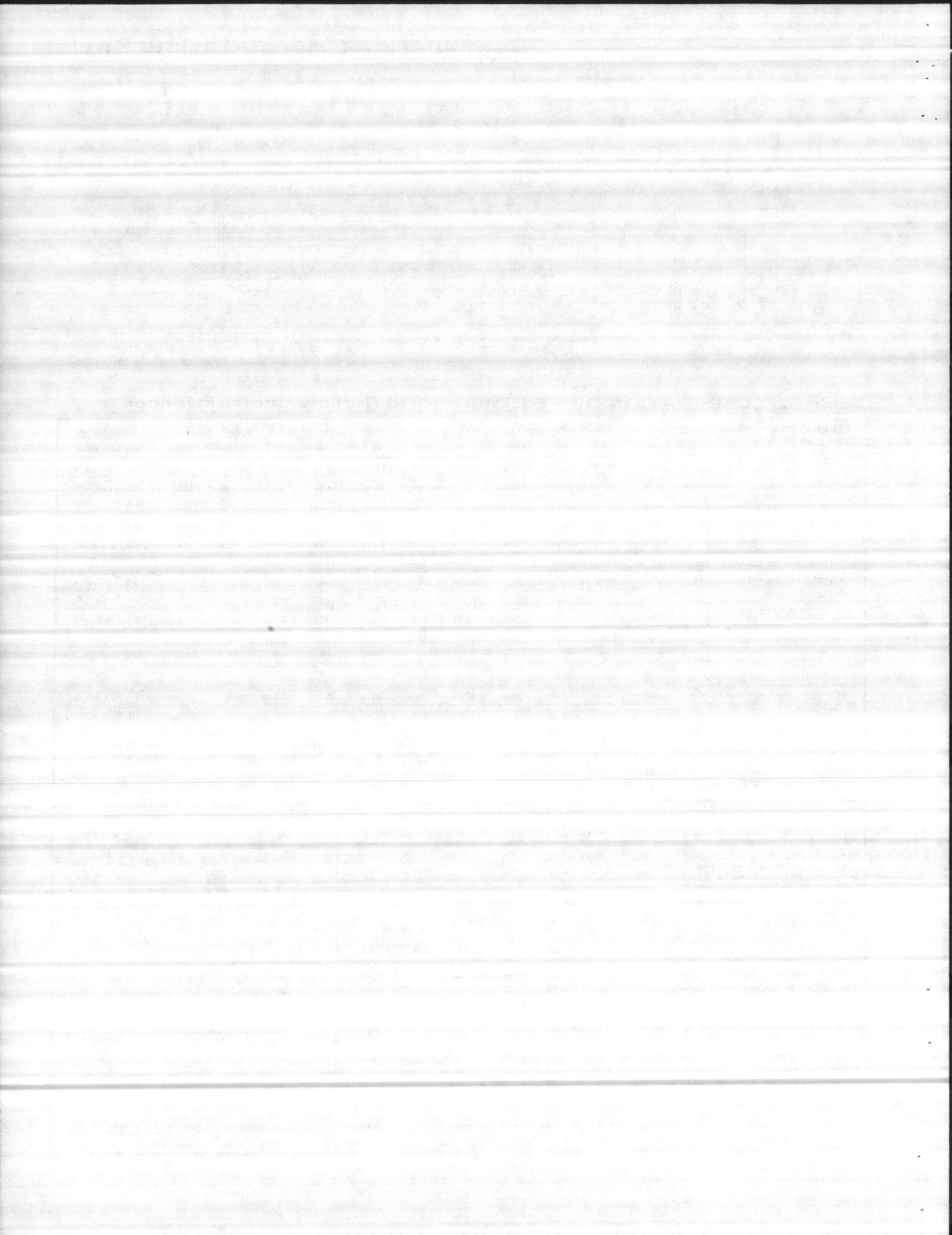
Dimensions XBD, XAJ, XAK, XBB, and XBF to suit electric motor

ROTATION



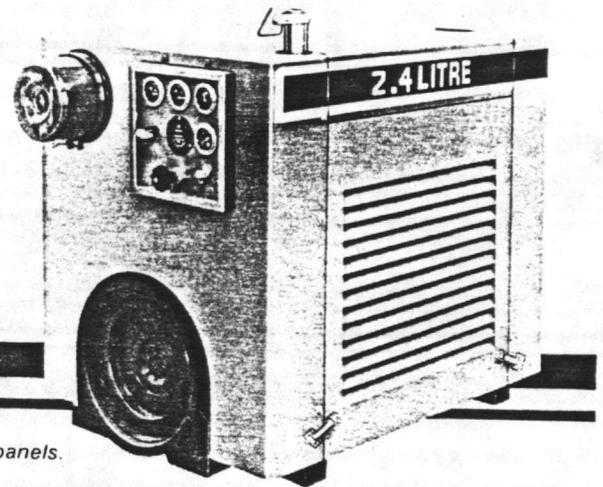
Tolerances: Shaft Extensions plus .000 minus .001; Base Rabbet AK plus .002 plus .005; Coupling Bore BX plus .0005 plus .0015. The combination drive is desirable where 24-hour service is mandatory and is preferred by municipalities and waterworks corporations. Electric motor or engine may be used to drive the pump, permitting removal of either for repairs without interrupting service. As with the standard drive, combination applications are also available with solid shaft construction. See page 9.

Gear drives with special rotation (Figs. 2, 3 and 4) and gear drives with speed decreasing of 7:4 or higher ratios are manufactured to order, and such orders are not subject to cancellation without charge for parts processed.



↓

YSD-424 Power Unit



Shown with optional side panels.

Standard Power Unit Equipment

Power-units include an engine assembly plus the following equipment:

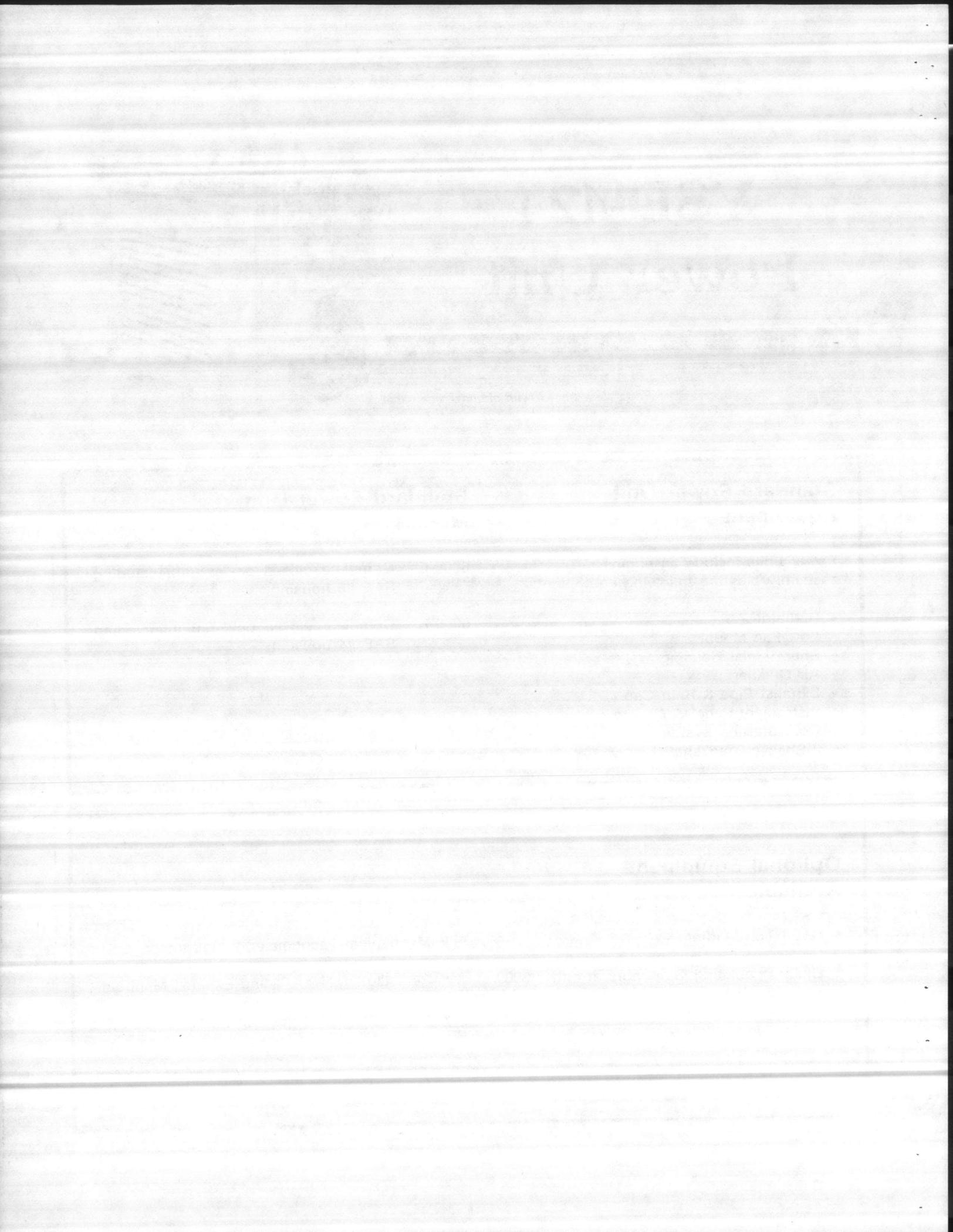
- Radiator
- Low Fan Mount
- Sheet Metal Housing
- Air Cleaner
- Exhaust Pipe & Rain Cap
- Instrument Panel & Controls
- Cold Starting System
- 3-Sheave Crankshaft Pulley

Standard Power Unit Models

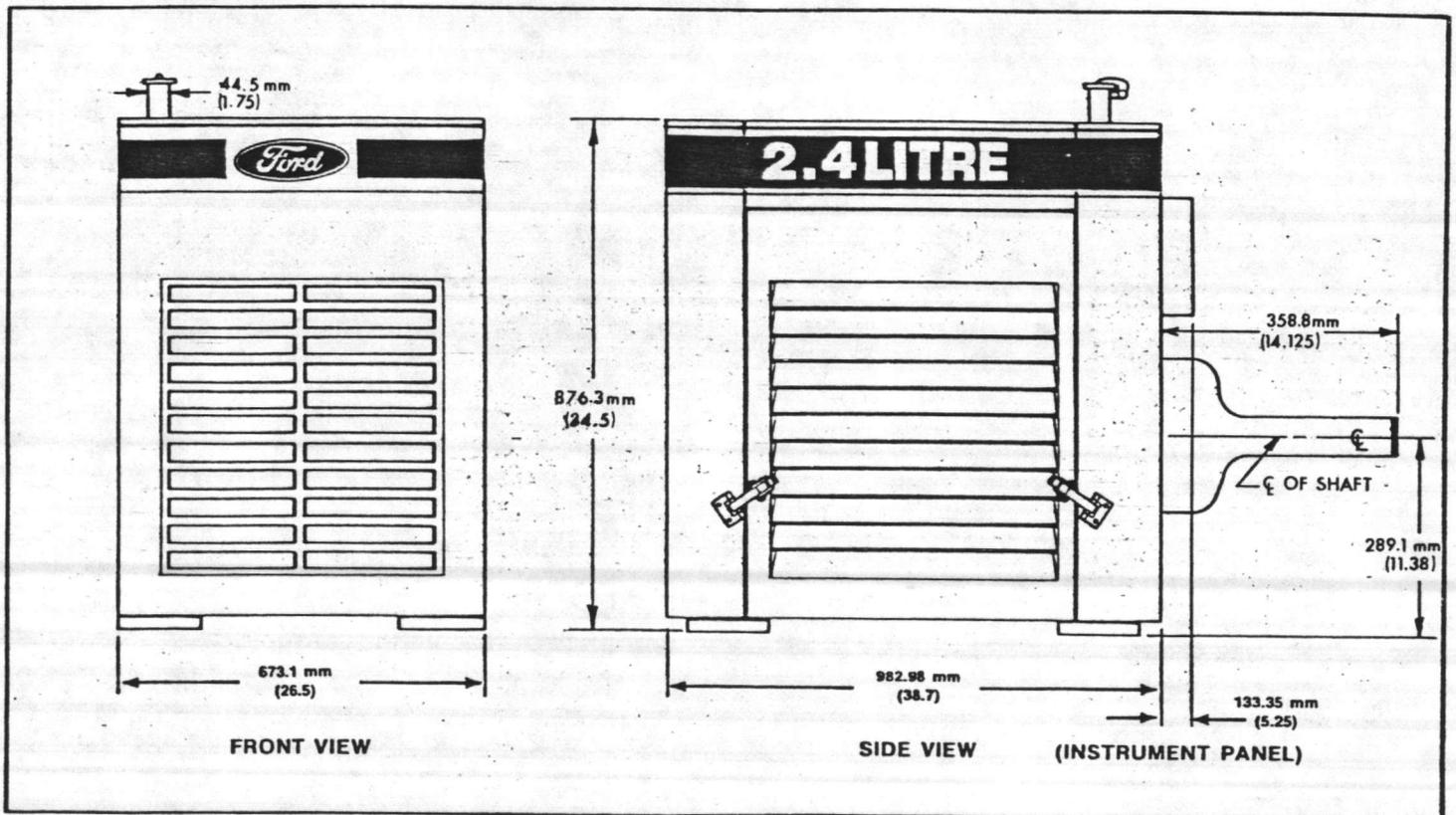
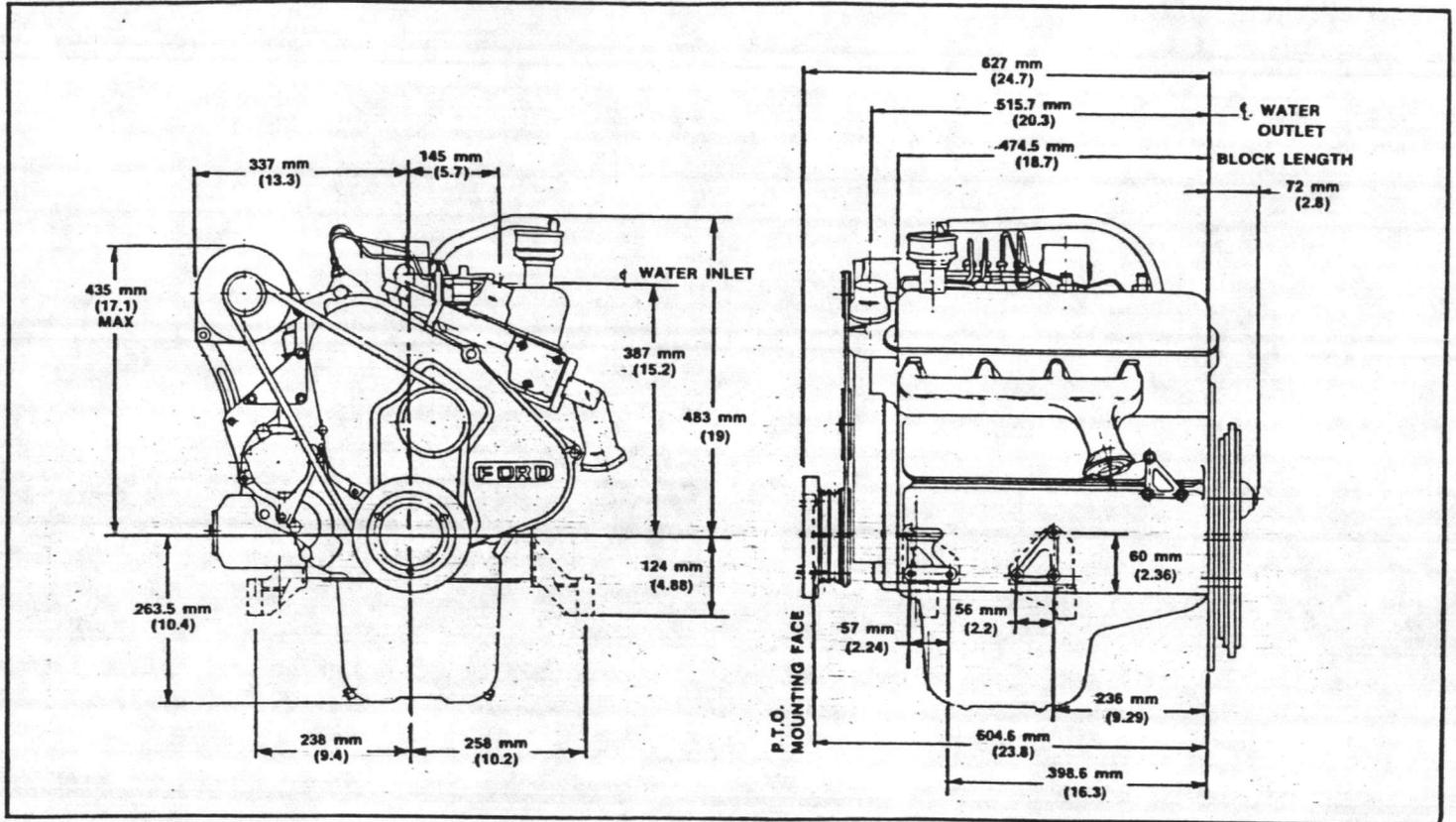
- 6006-E Complete closed power unit including SAE #3 housing.
- 6006-F Complete closed power unit including SAE #4 housing.

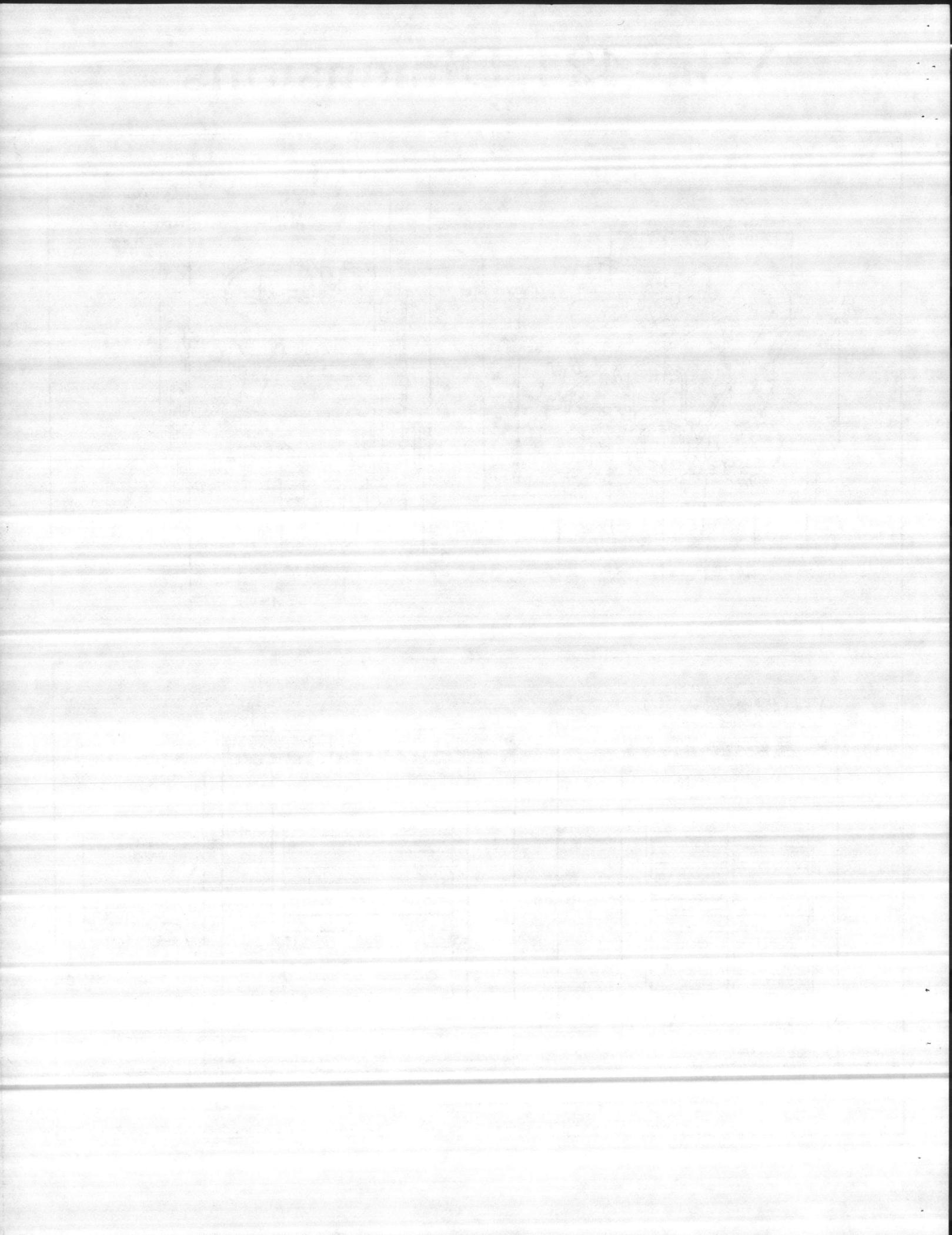
Optional Equipment Available

- Hood Top Muffler
- Close Regulating Governors at either 3000 or 3600 RPM
- Front Sump Oil Pan
- Mechanical Tachometer & Hourmeter
- Rear Outlet, Rear Facing Exhaust Manifold
- Hat Type Air Cleaner



YSD-424 Dimensions





Cold Starting Aids

Cold Starting Aids

Three types of cold starting aids are available on YSD engines:

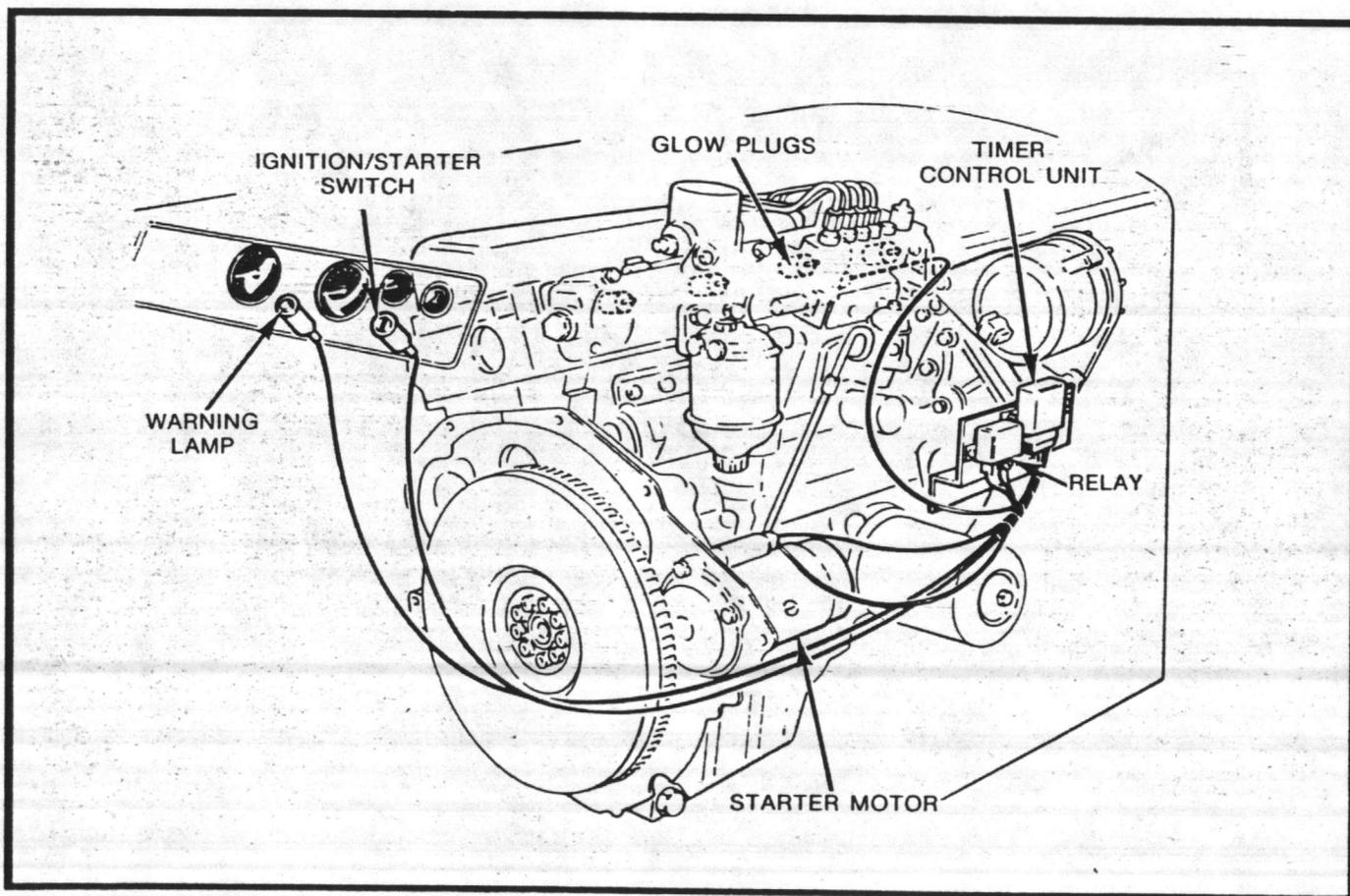
- **YSD-424** (4-cylinder) employs **glow plugs** and **thermostart** system for temperatures down to -10°C (14°F).
- **YSD-635** employs the **thermostart** system down to 14°F and the **ether** system for temperatures down to -20°C (-4°F).

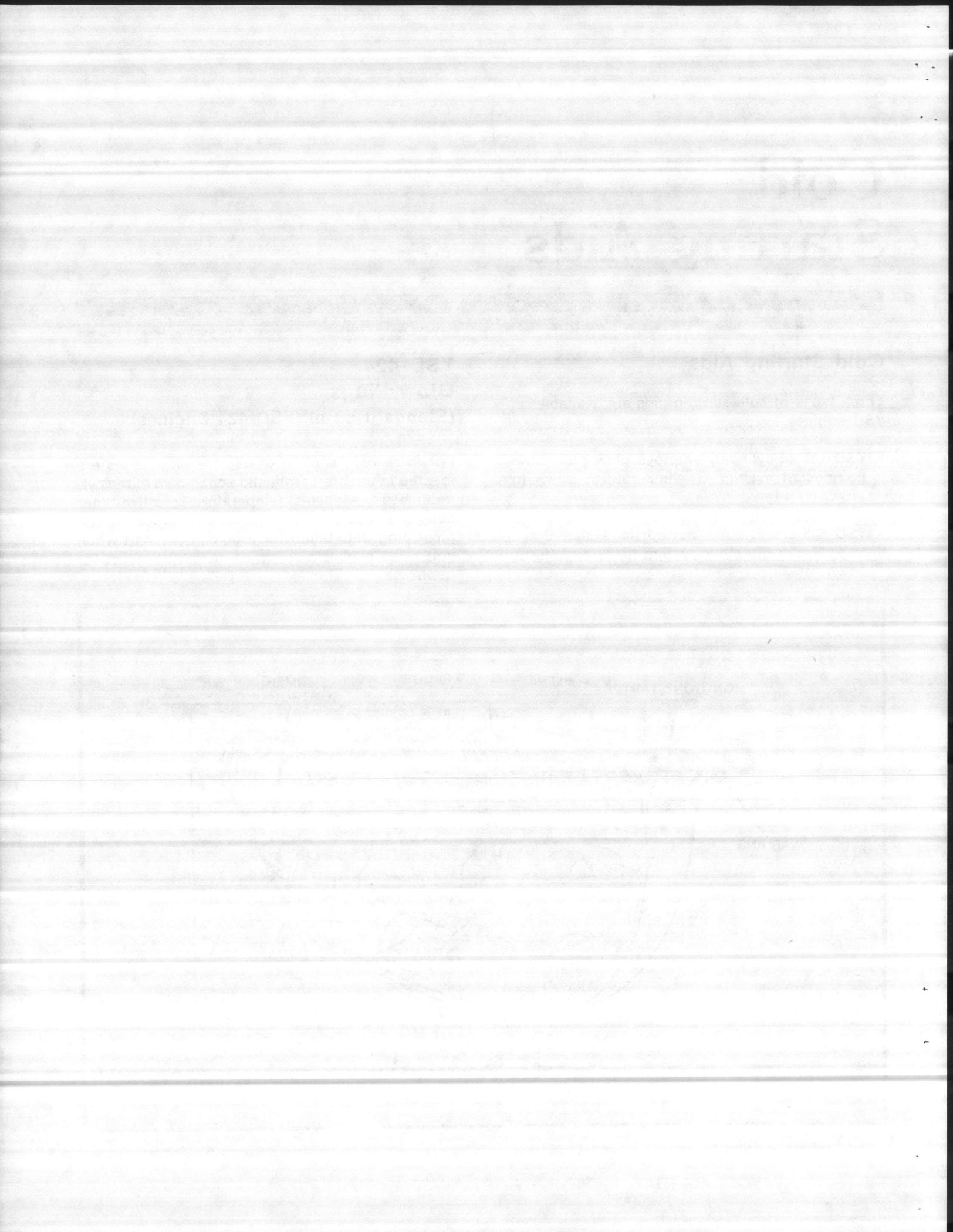
YSD-424

Glow Plugs

(Standard on all YSD-424 Engines)

For extra cold starting power, the **glow plugs** are located in the pre-combustion chambers of the cylinder head. A special **temperature sensitive timer control unit** automatically times the duration of the glow plug detonation for a quick cold start when you need it! Customer must install a bracket for controls.

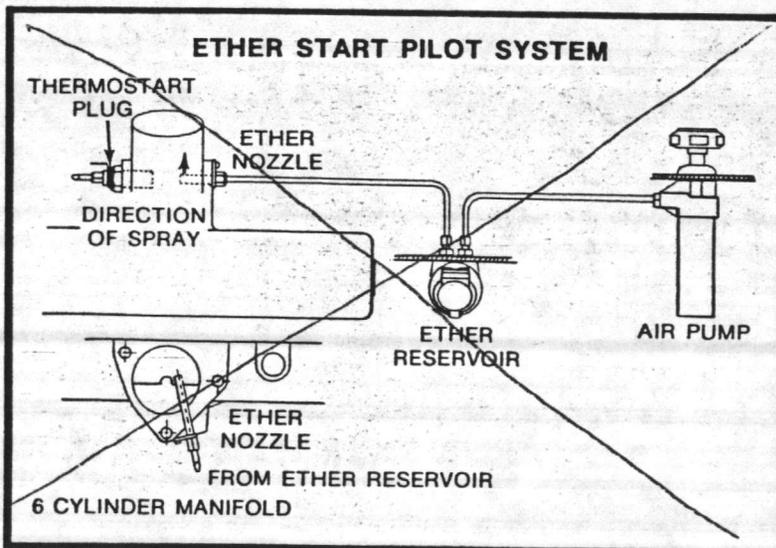
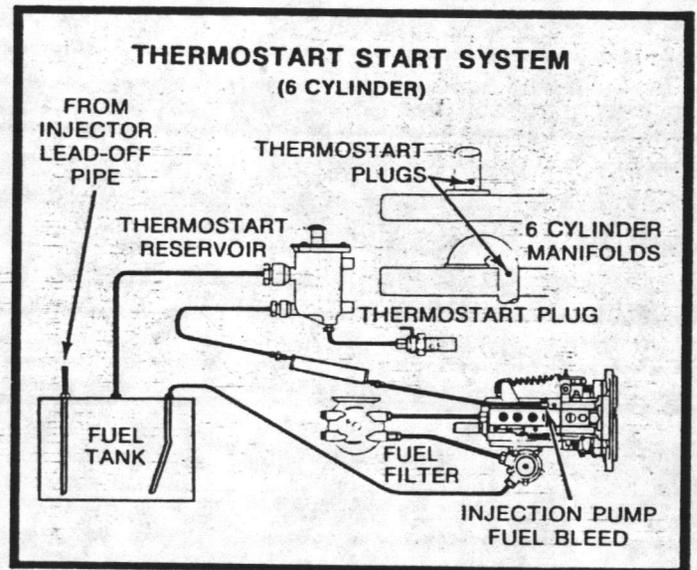




Starting power when you need it!

Thermostart System — 4- and 6-Cylinder

The thermostart system uses fuel oil to preheat the intake air. It receives fuel from the injection pump fuel bleed to the thermostart reservoir. The reservoir then supplies the fuel to the thermostart plug in the intake manifold. A switch on the control panel energizes the thermostart plug which ignites the fuel and preheats the air. Customer must supply the fuel lines.



The Ether Start Pilot System (6-Cylinder Only)

The Ether Start Pilot System is designed for very cold weather, down to -20°C (-4°F).

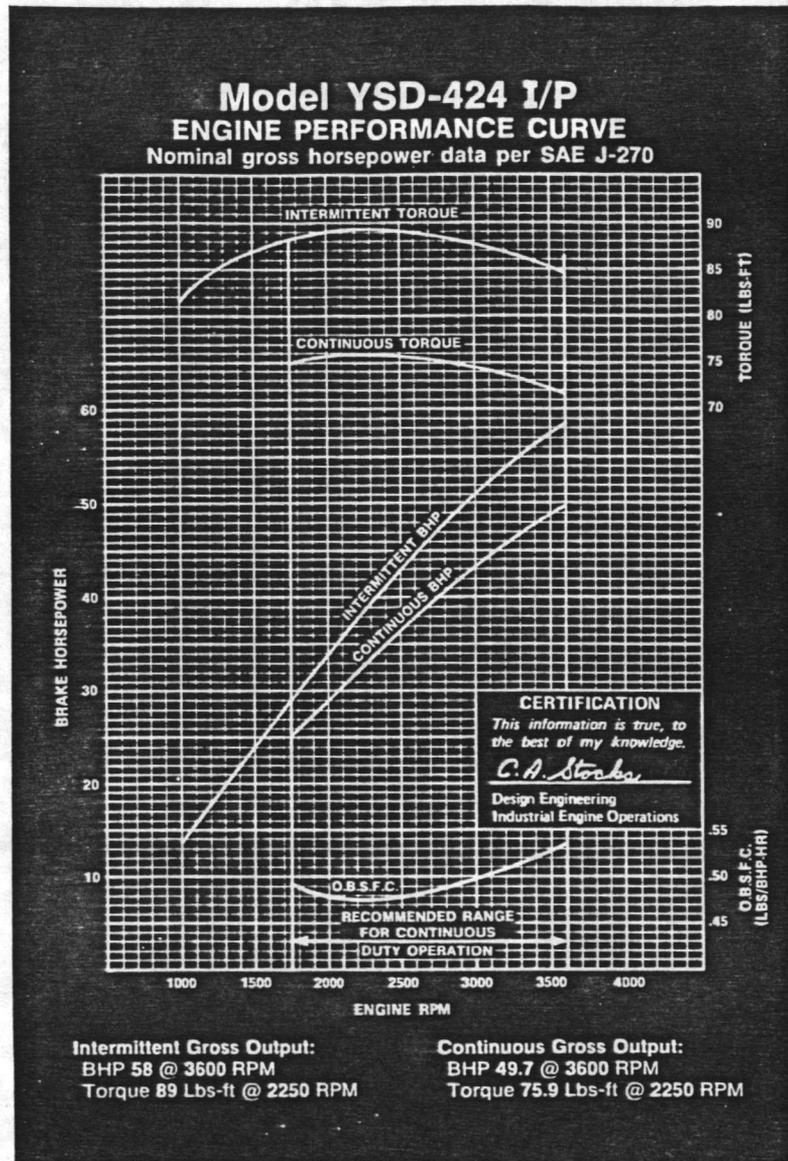
During Engine cranking, the air pump supplies a mixture of air and ether into the intake air stream which assists in igniting the fuel-air mixture during compression.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

REPORT OF THE
COMMISSIONERS OF THE
LAND OFFICE
OF THE STATE OF ILLINOIS
FOR THE YEAR 1887

CHICAGO: PUBLISHED BY THE
STATE OF ILLINOIS, 1887.

YSD-424 Performance

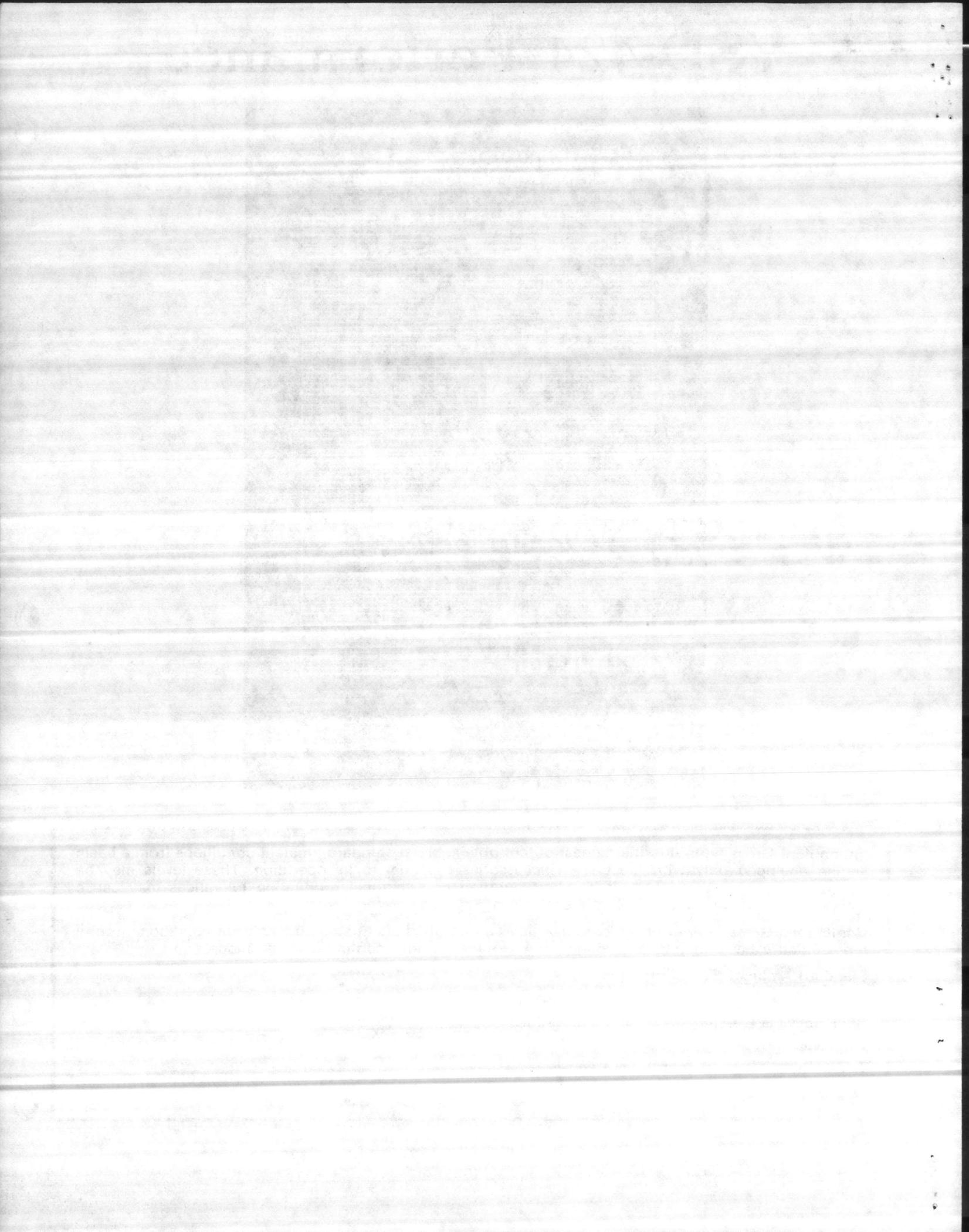


Intermittent Gross Output is the highest output obtainable at standard ambient conditions from a basic engine equipped only with the built-in accessories essential to its operation. These levels may be maintained for operating periods of short duration only. Normal production tolerances may cause variations of plus or minus 3.5% of these values.

Continuous Gross Output is the output which can be obtained at standard ambient conditions from a representative basic engine, as defined above, operating in a continuous duty mode.

Standard Ambient Conditions are:

Barometric Pressure	29.38 in. Hg. (99.0 Kpa)
Dry Barometric Pressure	29.00 in. Hg. (97.9 Kpa)
Water Vapor Pressure	0.38 in. Hg. (1.3 Kpa)
Temperature	85° F (29.4° C)
Dry Air Density	0.0705 lb./ft ³ (1.124 kg/m ³)



LAMARCHE

AUTOMATIC BATTERY CHARGERS

TYPE J - MODEL A-18

TYPE R - MODEL A-20

MANUFACTURERS AND ORIGINATORS OF THE WORLD'S MOST COMPLETE LINE OF BATTERY CHARGERS



for
**COMPLETELY SAFE
UNATTENDED
24-HOUR-A-DAY
BATTERY MAINTENANCE**

GENERAL DESCRIPTION

The type "J-6" La Marche Charger is for use with batteries of 3 lead-acid cells.

The type "J-12" Automatic Charger is for use with batteries of 6 cells.

The types R-24, R-30/32, R-36 La Marche Automatic Battery Chargers are for use with batteries of either 12, 15, 16 or 18 cells (24, 30, 32 or 36 volts).

Except for the difference in voltage output, the installation, setting, and operation of the types "J" and "R" are identical.

These FULLY AUTOMATIC Chargers are designed for permanent mounting near the engine and permanent connection to the battery and A.C. lines.

They will automatically charge one or two sets of batteries at some rate from $2\frac{1}{2}$ to 5 amps* depending on the state of charge of the battery.

Designed for 24-hour-a-day service on unloaded batteries; these chargers are normally set so they will automatically shut down to miliampere currents on fully charged batteries.

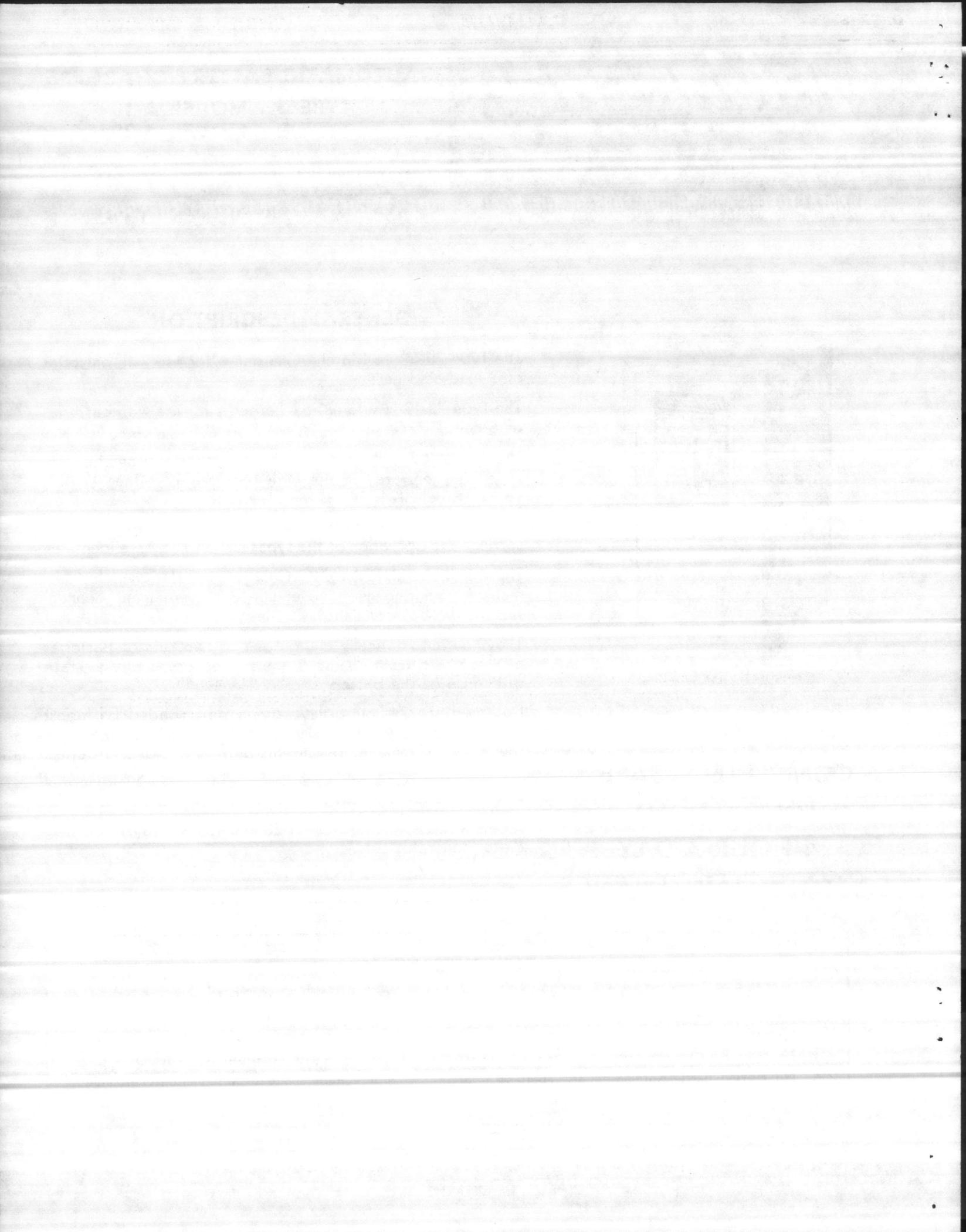
As all components are operated at far below their normal rating, you are assured of the longest possible service life.

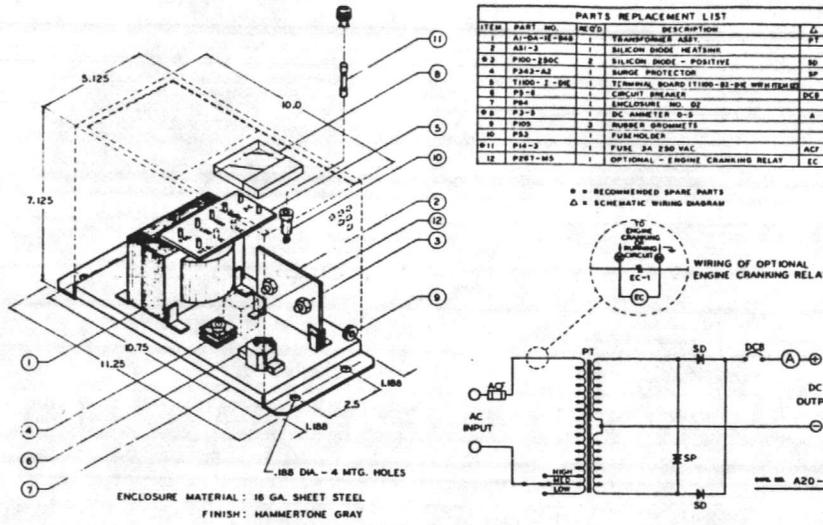
Meets MIL-G 18050B(MC) for 20 and 40 KW trailer mounted diesel generator sets.

*See specifications on back.

DESIGN FEATURES

1. Automatic in operation and self-regulating.
2. Cannot discharge battery if A.C. line current goes off.
3. No radio interference.
4. No moving parts. Nothing to arc, spark or wear out.
5. Ammeter to tell rate of charge.
6. No external controls. Cannot be tampered with.
7. Complete isolation of the A.C. line from the D.C. charging circuit eliminates the danger of high voltage shock to personnel on ungrounded equipment.





SPECIFICATIONS

ELECTRICAL

INPUT: 120, 208, 240 volts single phase, 50/60 cycles (select one)

OUTPUT:

		D.C. VOLTS	AMPS†
A-18	Type J-6	6	2
	Type J-12	12	3
	Type R-24	24	4
A-20	Type R-30	30	5
	Type R-32	32	5
	Type R-36	36	5

†Maximum amps. output on discharged batteries shown.

MECHANICAL:

FINISH: Hammertone, light gray, baked enamel

MOUNTING: Mounting flanges are supplied as part of the cabinet back plate.

STANDARD ACCESSORIES SUPPLIED:

1. Output ammeter.
2. Auto-reset D.C. circuit breaker.
3. A.C. fuse.

OPTIONAL ACCESSORY:

See Accessory Price List

1. A.C. cranking circuit disconnect relay.

SAMPLE SPECIFICATIONS FOR J & R UNITS

The charger to be furnished shall be the LA MARCHÉ MFG. CO. Type J or R, and, once set, shall automatically hold the battery voltage at approximately 2.33 volts per lead-acid cell on fully-charged unloaded batteries. Meets MIL-G 18050B(MC) for 20 and 40 KW trailer mounted diesel generator sets.

Tap settings shall be provided on an internal panel so that the charger can be set for the battery it is to be used with and adjustments can be made to compensate for a ±10% line voltage range.

THIS CHARGER SHALL HAVE:

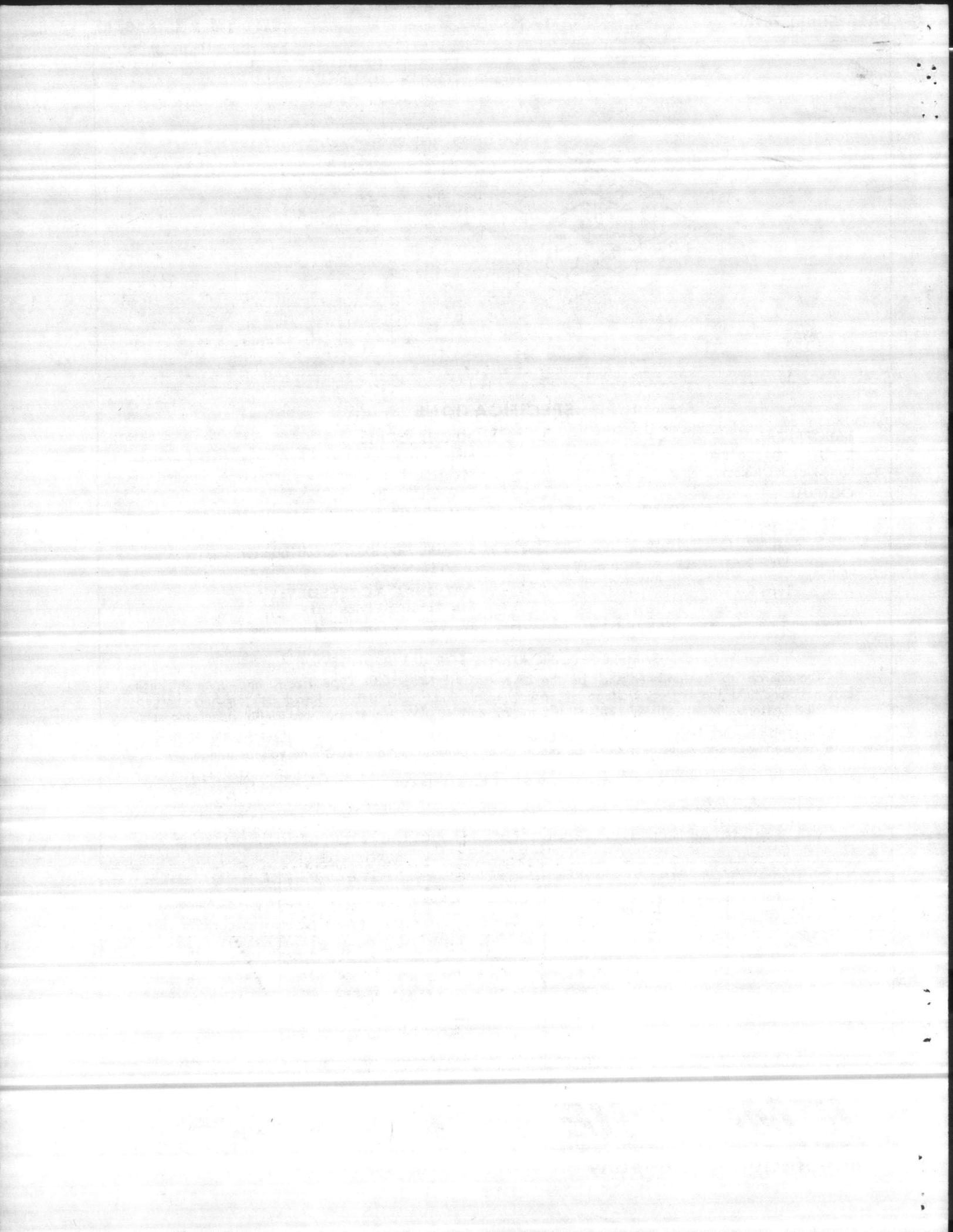
- | | |
|---------------------------------------|------------------------------------|
| A. Silicon diode full-wave rectifiers | D. D.C. output ammeter |
| B. Automatic surge suppressor | E. Auto-reset D.C. circuit breaker |
| C. No moving parts or switches | F. A.C. fuse |

Model	Type	D.C. Output		Approx. Weight
		Amps.	System Voltage	
A-18	J-6	2	6	18
A-18	J-12	3	12	18
A-20	R-24	5	24	20
A-20	R-30/32/36	5	30/32/36	21



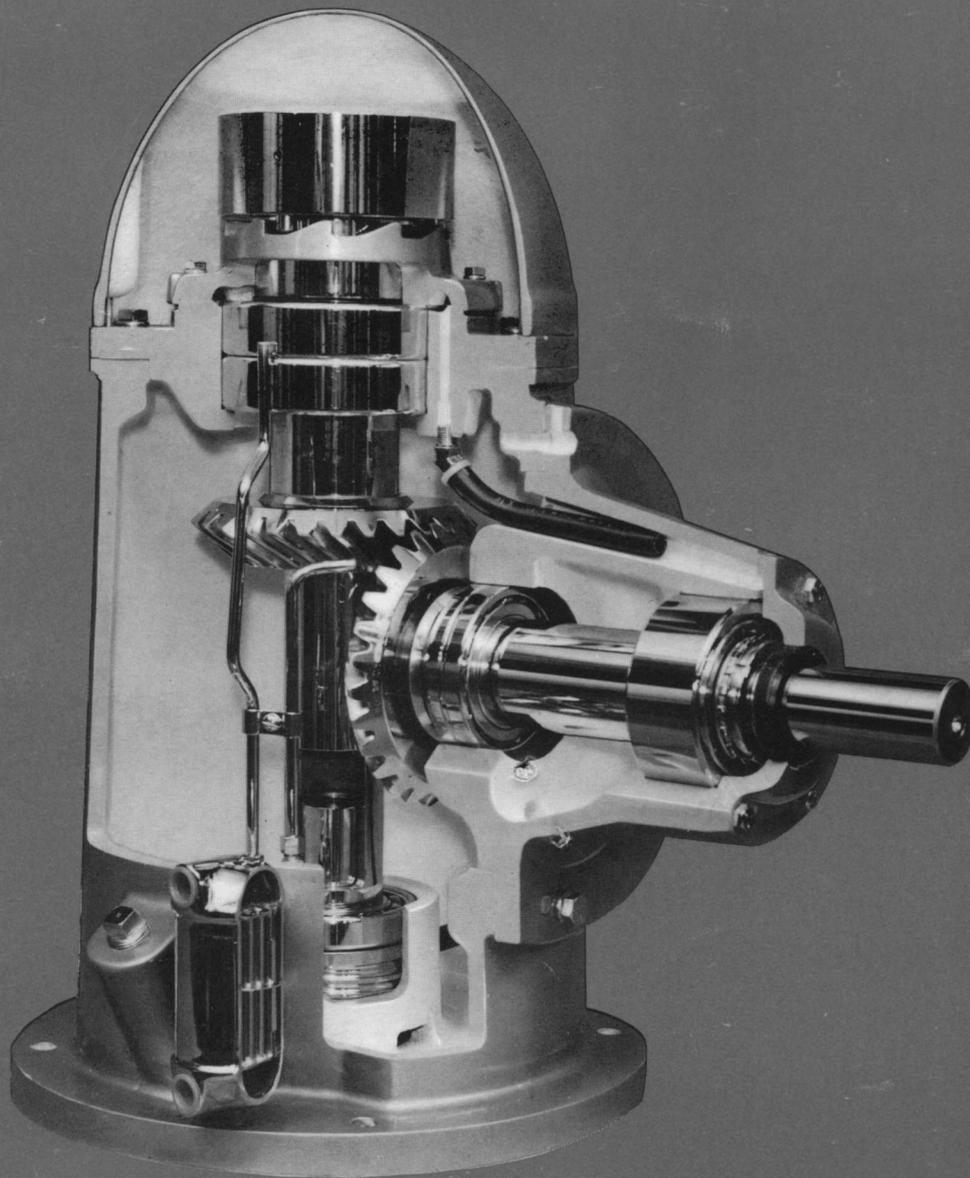
106 Bradrock Drive, Des Plaines, Illinois 60018

CONTACT LOCAL SALES OFFICE FOR PRICING & APPLICATION INFORMATION





OPERATOR'S MANUAL FOR THE JOHNSON GEAR RIGHT ANGLE DRIVE



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FOUNDATION

A *solid level* foundation is necessary to prevent vibration and misalignment, both of which are detrimental to your gear drive. Width and length of the base will be governed by size of gear drive, size of engine, and specifications of the pump head.

SHORT COUPLED INSTALLATIONS BETWEEN GEAR DRIVE AND ENGINE SHOULD HAVE A COMMON FOUNDATION.

The depth of the foundation should extend down to a solid footing, if possible, and will depend on the type of soil, total weight of the installation, and the climate. Where freezing temperatures occur, the foundation should extend below the frost line.

INSTALLATION

The base of every Johnson Right Angle Gear Drive is provided with a machined rabbet to insure centering on the pump head. Therefore, it is essential that the pump shaft be in the exact center of the corresponding rabbet in the pump base.

Since a faulty headshaft will cause vibration and ultimately destroy the bearings and gears, it must be thoroughly checked for straightness and alignment. The procedure for checking the headshaft, which is outlined below, requires removal of the dome cover from the drive. *While the dome is off, care must be taken to protect against grit and dirt as even a small amount might cause damage to the bearing located in the top of the drive.*

Checking the Headshaft

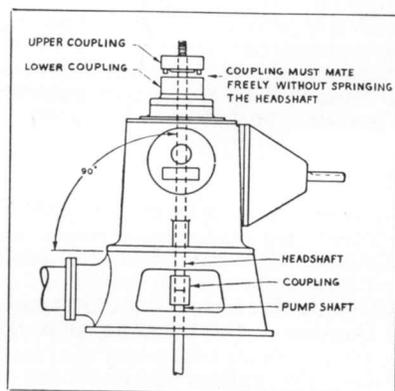


Figure 1

Before an alignment check can be made, it is necessary to ascertain that the headshaft is true to size, that diameters are concentric if shaft changes in diameter, and that it is absolutely straight throughout its length.

Combination drives are furnished with a steady bearing to prevent whipping of the headshaft under electric motor operation. The headshaft of such drives must therefore be tested for fit in the steady bearing.

Steady bearings are of the sealed ball bearing type and are mounted on adaptor sleeves through which the head shaft *must be a sliding fit* but not a press fit.

Headshafts are sometimes made with the pump coupling end larger than the hole in the hollow shaft of the gear drive. This makes it necessary to lower the drive on the pump head with the headshaft coupled in place. Particular care must be taken in such cases to avoid bending the headshaft or damaging the oil seal tube.

Mounting the Drive

After the headshaft has been thoroughly checked, inspect the machine fit of both gear drive and pump head for burrs or obstructions. Install the drive on the pump head and bolt in place, tightening thoroughly and evenly.

With the headshaft in place, slip on the upper coupling and lower it carefully into position. **WHEN THE UPPER COUPLING POSITIONS ON THE LOWER COUPLING WITHOUT SPRINGING THE HEADSHAFT, IT INDICATES THAT THE UNIT IS CORRECTLY ALIGNED.** Correct the alignment if upper and lower couplings do not meet properly.

With the gear drive and headshaft correctly aligned, install the ratchet pins and gib head key in the upper coupling. This key should be a slide fit, permitting adjustment of the headshaft by means of the adjusting nut. Tighten the nut as directed by the pump manufacturer, and lock with screw provided for this purpose. **DO NOT OIL THE RATCHET PINS.**

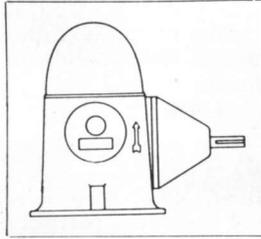


Figure 2

Checking the Rotation

Check the rotation of the power unit and pump in relation to that of the drive, as shown by the arrow on the case. **DO NOT OPERATE IN THE REVERSE DIRECTION OF THE ARROW**, as the lubrication system will not function and the destruction of the drive will result. Rotate the drive by hand before applying the power as a precaution against a bound or locked installation. Figure 2 shows drive with standard rotation.

Oil Cooler Connection

Models H-60 and larger are supplied with counter-flow oil coolers with water connections taped for 1/2" standard pipe. These connections are arranged vertically, the top connection for the inlet and the bottom connection for the outlet. Use rubber hose or copper tubing for water supply. **DO NOT MAKE A RIGID PIPE CONNECTION.** A moderate amount of cold water should flow through the cooler when the drive is operating, and provision should be made in the piping to permit draining the cooler in localities subject to freezing weather conditions.

Under normal conditions with 70° F water available requirements are approximately 2 to 3 gpm (Models H-60 thru H-200) and 4 to 6 gpm on larger gears. Maximum allowable water pressure 75 psi.

Filling with Oil

Correct lubrication of your Johnson Right Angle Gear Drive is a **MUST** for satisfactory operation. As the operator of this equipment, it is your responsibility to **KEEP THE OIL RESERVOIR FILLED AT ALL TIMES.**

Fill the oil reservoir until the oil is level with the top of the filling hole or the line on the gauge marked "Full." Be sure to tighten plug securely after filling or draining.

Look in the section on "Lubrication" for information about grades of oil, frequency of oil changes, and other data on the lubrication of the gear drive.

Oil reservoir capacities are as listed below:

<i>Model</i>	<i>Gallons</i>
H-20, H-30	1/2
H-40 (12)	3/4
H-40, H-60, H-80	1
H-110, H-125	1 1/2
H-150, H-200	3
H-280	4
H-350, H-425, H-500, H-600	6

OUR WARRANTY DOES NOT PROTECT YOU IN THE EVENT OF FAILURE FROM NEGLIGENCE IN MAINTAINING SUFFICIENT OIL OF RECOMMENDED GRADE IN THE GEAR DRIVE.

CONNECTING THE POWER UNIT

Coupling Installation

Care should be taken in selecting the proper type and size of coupling. The great majority of installations will require a Universal joint of standard length, as this type is capable of absorbing the misalignment which may occur due to installation errors or settling of earth around the well. Installation should be preferably made as nearly in line as possible and it is extremely important that the center line of the engine be parallel to the center line of the drive shaft within 2 or 3 degrees. This precaution will prevent an unbalanced condition which would result in vibration and be detrimental to the gear drive bearings and drive shaft.

Certain types of flanged flexible couplings are suitable for close coupled drives, providing pump head and power unit are on the SAME RIGID FOUNDATION. Such couplings should be mounted and maintained according to the manufacturer's instructions. NEVER USE A RIGID FLANGED COUPLING.

IN FITTING THE UNIVERSAL JOINT OR FLEXIBLE COUPLING FLANGE TO THE DRIVE, IT SHOULD BE MACHINED FOR A PUSH FIT WITHOUT THE USE OF EXCESS POWER, AS HAMMERING ON THE DRIVE SHAFT WILL DAMAGE THE BEARINGS AND DESTROY THE ADJUSTMENT OF THE GEARS.

LUBRICATION

General Information

Careful attention to the lubrication requirements and use of the correct grade of oil is essential to continued and satisfactory operation of your Johnson Right Angle Gear Drive. *Gear drives should not be operated at speeds 15% above or below the nameplate RPM without consulting the Factory.* The operating speed of your drive is shown on the nameplate.

Changing Oil

Proper lubrication requires that the oil be changed at least once every six months or after 2500 hours of operation, whichever occurs first. Should extreme changes of temperature or humidity cause condensation in the reservoir, the oil should be changed more frequently. Drain the oil when hot, inspecting for water. Be sure to change the oil at the end of the operating season to remove any moisture which would otherwise rust the bearings and other finely machined parts.

Oil changing at the recommended time interval aids in restricting the amount of acid which may form in oils under high temperature and pressure conditions. Acids are injurious impurities in lubricating oils, since they attack the machine parts.

Keep the "Lubrication Record" as a guide for making these oil changes at the proper intervals.

Cold Weather

* Close attention should be given the drive when starting under freezing conditions. The oil becomes very thick at low temperatures, which may result in flooding the thrust bearing (as evidenced by oil leak at top of drive). In such cases, providing the leak does not cease as the drive warms up, stop the drive and allow the oil to drain and then restart. Removal of dome on standard drives is required for above observations. CAUTION: *Be sure to check oil flow to gears when starting under low temperature conditions.*

Recommended Oil

The high-grade oils approved for the Johnson Right Angle Gear Drives are less susceptible to emulsification (mixing with water) and oxidation than other oils.

RECOMMENDED OILS

Ambient Temp. °F	15-60	50-90	80-125
A.G.M.A. Grade	3	4	5
Visc. SUS at 100° F	410-500	615-765	918-1122
Visc. cSt at 40° C (I.S.O.)	100	150	220
Amoco	Ind. Oil 100	Ind. Oil 150	Ind. Oil 220
Cato Oil	PMO 1501		PMO 1505
Chevron-USA	E.P. Mach. 100	E.P. Mach. 150	E.P. Mach. 220
Citgo	Pacemaker 100	Pacemaker 150	Pacemaker 220
Exxon-USA	Teresstic 100	Teresstic 150	Teresstic 220
Getty	Skelvis MP30	Skelvis MP40	Skelvis MP50
Gulf-USA	Harmony 90	Harmony 150D	Harmony 220
Mobil Oil	Mobil Gear 627	Mobil Gear 629	Mobil Gear 630
Pacer	Thermal T465	Thermal T700	Thermal T1000
Phillips	Magnus 100	Magnus 150	Magnus 220
Shell-USA	Turbo 100	Turbo 150	Turbo 220
Sun Oil	Sunmark 251	Sunmark 275	Sunmark 299
Texaco	Regal R&O 100	Regal R&O 150	Regal R&O 220
U.S. Navy	Mil-L-17331-F		

S.A.E. Automotive oils are NOT satisfactory and *must not be used* in the gear drive. USE OF AUTOMOTIVE OILS WILL VOID OUR WARRANTY.

OPERATION

The following operating recommendations are made to aid you in keeping your gear drive in the best possible condition. Careful attention to these details will prolong the useful life of your equipment.

Starting

Always check the oil level in the housing of the gear drive and add oil if needed. Inspection when starting and regular checks during the operating period will prevent failure of the gear drive due to poor oil circulation. Should the circulation appear to be lagging, check the oil level and the age of the oil in the drive. Oil tends to thicken with use and old oils will not circulate properly in the gear drive oiling system.

Turn by hand the drive shaft between pump and engine to check whether pump turns freely. (When the engine has no clutch, as in fire pump drives, it will be necessary to uncouple the shaft.)

When the drive is furnished with a non-reverse clutch, check to see that ratchet pins are clean and drop readily. Do not oil pins.

Before applying power replace dome and all covers and guards.

Apply power to drive gradually, but do not idle at low speed for a long period.

Observe carefully the entire installation during the starting period and do not leave until satisfied that all units are functioning properly.

Operating Temperatures

A standard drive operating at 1750 RPM pump speed under rated load and normal atmospheric conditions will reach a temperature of approximately 130-170°F depending on whether the unit is air or water cooled and local conditions peculiar to the installation. It is not possible to hold one's hand on the gear drive case except momentarily when temperatures exceed 135°F.

Increased speed, high loads, or lack of air circulation will cause the temperature to rise, but the oil temperature should not at any time exceed 200°F. A thermometer may be used at the oil filling hole of the drive to obtain actual temperatures if unusual conditions exist. When starting the drive at temperatures below 10°F, the oil should first be checked to see whether it is above the pour point. The drive must not be operated if the oil does not flow, which limiting condition exists at approximately 10°F.

Shutdown Periods

When the installation is to be inoperative for a considerable time, such as after the completion of an irrigation period, the gear drive should be drained while hot and then replenished with new oil.

Occasional brief operation during extended shutdown periods will help prevent damage from condensation and will benefit the bearings by changing the position of the balls and races. This procedure is of equal benefit to the engine, as it spreads an oil film on the cylinder walls, rings, bearings, etc.

In localities where freezing conditions prevail, drain the water from the oil coolers of drives so equipped.

Long Term Storage

1. Fill with oil in appropriate amount for storage period only. Replace oil when put into regular duty.
2. Spray exposed machined parts (i.e., base, shaft end, upper coupling) with rust-retarding oil.
3. Operate gear drive every month long enough to oil bearings and gears to prevent condensation and rusting.
4. Store in heated building if at all possible.
5. Cover with tarpaulin or other dust shield.

General Precautions

The bearings furnished are of high quality and have been approved by the manufacturer for the rated loads and speeds of the gear drives in which they are used. Bearing life is directly affected by the care given in operating the equipment and adherence to the instructions given in this manual. Usually a bearing will become noisy and give adequate warning of impending failure. Do not operate the gear drive with noisy bearings as destruction of the gears will result if the bearing should fail.

Changes sometimes occur in the water level, or alterations may be made to the pump subsequent to selection and installation of the gear drive. Such changes will usually affect the operating conditions of the gear drive and should be thoroughly investigated.

As mentioned repeatedly in this manual, lubrication is the most important factor affecting the life of the drive, which, given ordinary care and properly operated, will give exceptionally trouble-free service.

Special Instructions

Johnson Right Angle Hollow Shaft Gear Drives used for Factory Mutual and NPFA fire pump installations are not permitted to omit or disable the non-reverse ratched coupling. Nor is the use of disconnecting couplings or clutches permitted between the engine and gear drive, or to reset the engine from its pre-set speed.

COMBINATION DRIVES

All the preceding operating instructions are applicable to the combination drive. There are also special instructions which must be followed according to the particular application.

Standard Combination

In most installations, the gear drive and engine are required for standby service only. The installation is therefore made so that the electric motor drives the pump and also carries the thrust load. The coupling at the top of the gear drive is free to turn when the electric motor is driving the pump, running clearance being maintained by a compressible spacer. (Figures 3 & 4)

When pump operation by the engine through the gear drive is required the stainless steel bolts are used to fasten the coupling halves together (Figure 4). This procedure permits transmission of power through the right angle gear drive, but does not alter the setting of the pump. The pump thrust load is still carried by the electric motor.

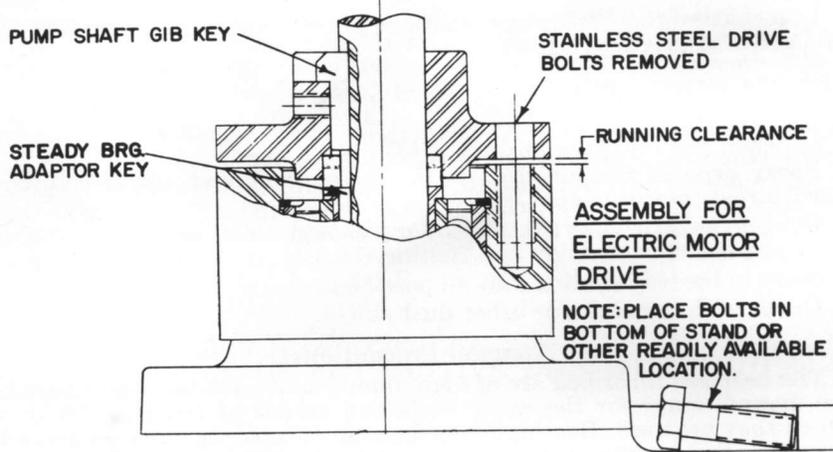


Figure 3

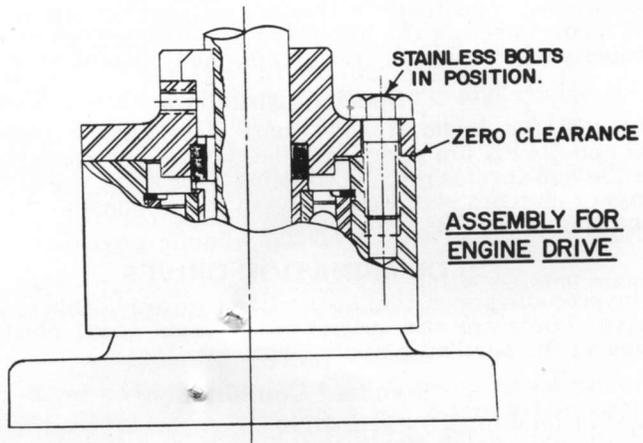


Figure 4

Redi-Torq®

The Johnson Redi-Torq® Gear Drive is manufactured specifically for automatic installations and permits the use of standard flexible shafting between the gear drive and engine. If your gear drive is a Redi-Torq® you must read and comply with the supplementary instructions accompanying this manual. Contact the factory prior to making the installation if the pamphlet is missing.

Solid Shaft

This type of drive is used with solid shaft electric motors. The gear drive and electric motor are connected together by a flexible coupling. Most installations using this drive are of dry pit design and flexible shafting is used between the pump and gear drive.

With solid shaft combination drives, the electric motor revolves when the engine is driving. Means of disconnecting the gear drive and engine must be provided.

MAINTENANCE

General

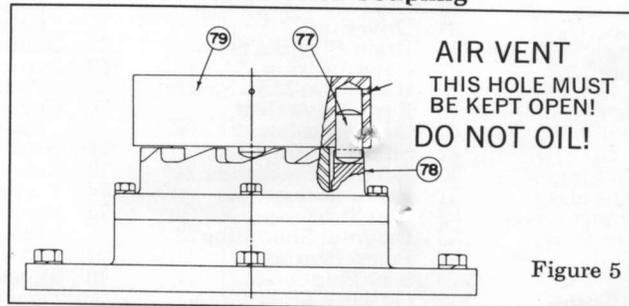
A Johnson Right Angle Gear Drive which has been properly installed and operated according to instructions furnished will give years of dependable service with a minimum of maintenance. Instructions included in this manual are to inform you of correct maintenance procedure.

Repairs should only be undertaken by a skilled mechanic, fully capable of doing the work; and when for any reason extensive maintenance beyond the scope of this manual is required, the drive should be returned to our factory with transportation charges prepaid. This allows our trained mechanics, aided by specialized tools and equipment, to reassemble and test your gear drive under controlled conditions. Factory reconditioning, wherein all worn parts which in our judgement require renewal are replaced, has the additional advantage of carrying a new drive warranty. No allowance is made for parts removed, and such parts are returned on request.

Alterations or repairs made outside the factory without our approval are at buyer's risk and void the warranty. We suggest that you read the terms of our warranty before undertaking any repair work on the drive. (See back cover.)

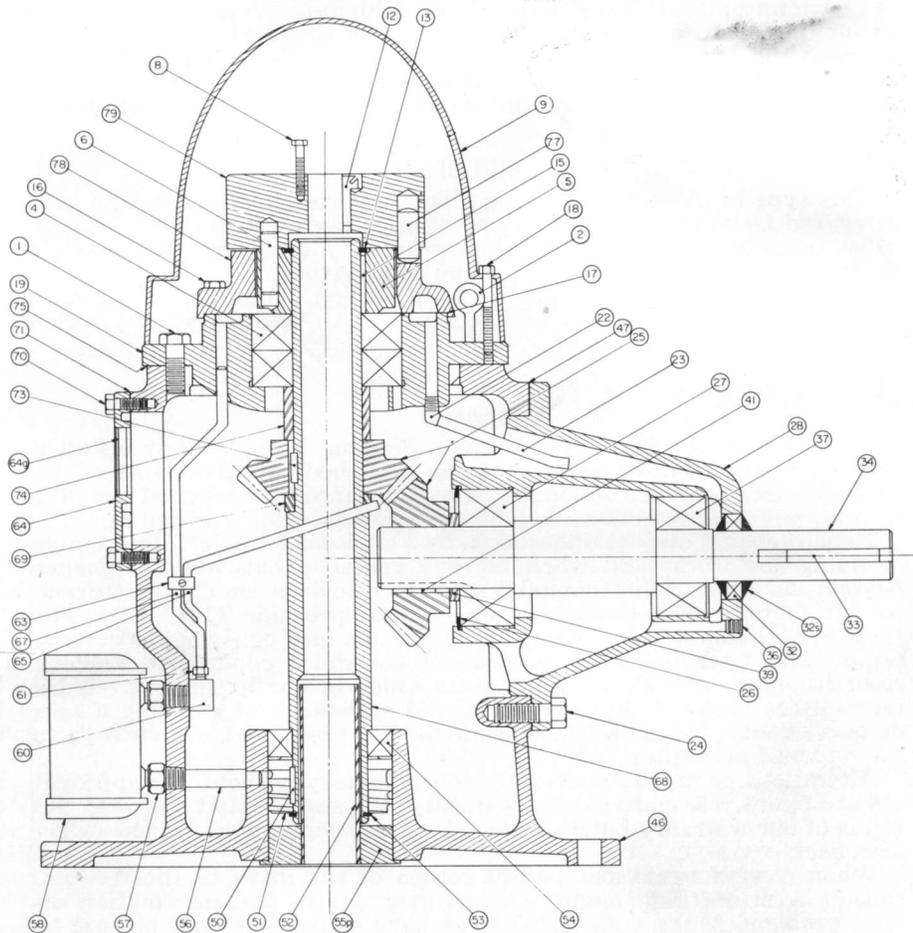
When conditions do not permit return of the drive to the factory, consult with our Engineering Department, giving full information on your problem. Make your data as complete as possible, and be sure to include the serial number of the drive and approximate length of service.

Non-Reverse Coupling



The operation of a Johnson Non-Reverse Coupling is extremely simple and requires a minimum of maintenance. The ratchet pins must operate freely, and will therefore require an occasional cleaning. They must never be oiled as this would result in formation of a gummy film, preventing their dropping freely into position as forward rotation slows down.

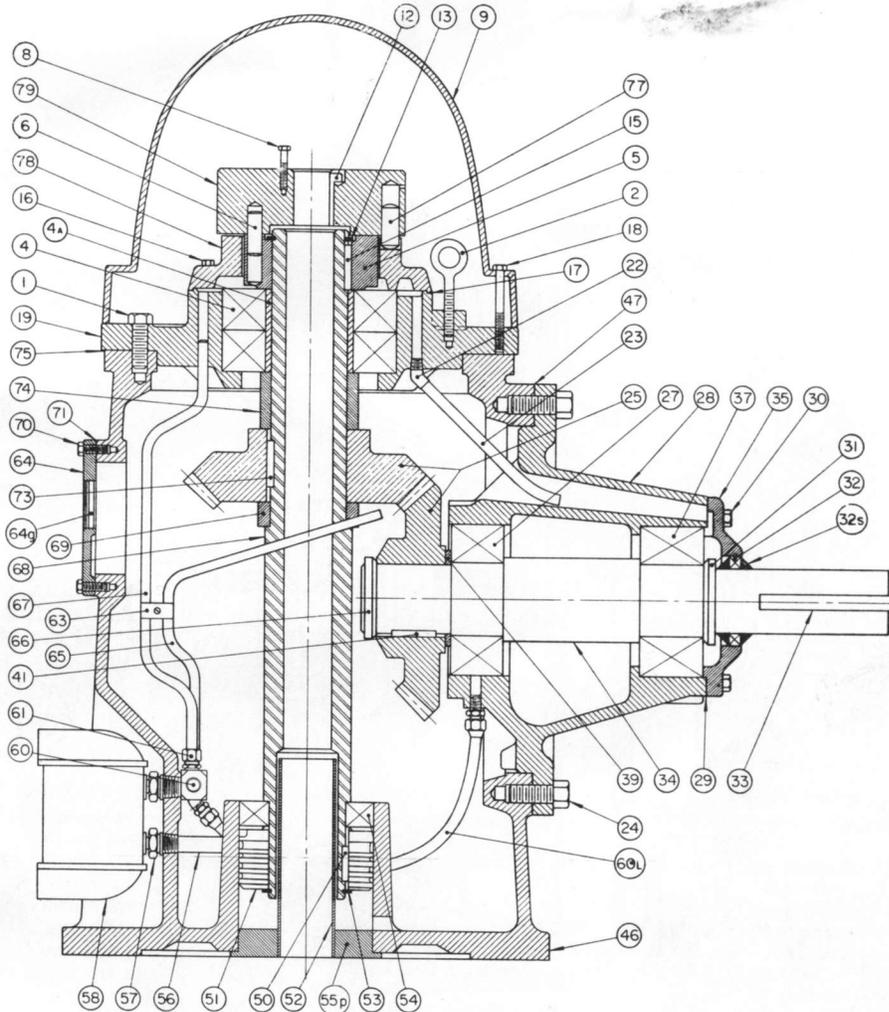
TYPICAL MODEL H-20 - H-60



No. 1	Capscrew—Thrust Cage	No. 33	Key	No. 67	Oil Tube to Thrust Bearing
* 2	Lifting Eyebolt	34	Driveshaft	68	Hollow Shaft
4	Thrust Bearing	36	Drain Plug-Set Screw	*69	Lower Hollow Shaft Spacer
5	Lower Coupling	37	Outer Bearing	70	Capscrew—Insp. Plate
6	Coupling Pin	39	Horizontal M.D. Spacer	71	Gasket—Insp. Plate
8	Capscrew	41	Key—Drive Gear	73	Key—Driven Gear
9	Dome	46	Main Housing	74	Vertical M.D. Spacer
12	Gib Key	47	Shim—Horiz. Hsg.	75	Shim—Thrust Bearing Cage
13	External Snap Ring	50	Key—Pump Runner	77	Ratchet Pins
15	Key—Lower Coupling	51	Pump Runner	78	Thrust Bearing Cover
16	Capscrew—Thrust Cover	52	Seal Tube	79	Upper Clutch
17	Gasket—Thrust Cover	53	External Snap Ring		
18	Capscrew—Dome	54	Pump Bearing		
19	Thrust Bearing Cage	55P	Seal Plug		
*22	Flexible Tube Fitting	*56	Oil Tube From Pump		
*23	Flexible Tube	*57	Cooler Flexible Fittings		
24	Capscrew—Horiz. Hsg.	*58	Oil Cooler (H60 Only)		
25	Gears	60	Oil Distributor		
26	Internal Snap Ring	61	Compression Fitting		
27	Inner Bearing	63	Oil Tube Clamp		
28	Horizontal Housing	64	Inspection Plate		
32	Oil Seal	*64G	Oil Sight Glass		
* 32S	Slings	65	Oil Tube to Gears		

* These parts are not universal and are omitted in certain ratios and models.

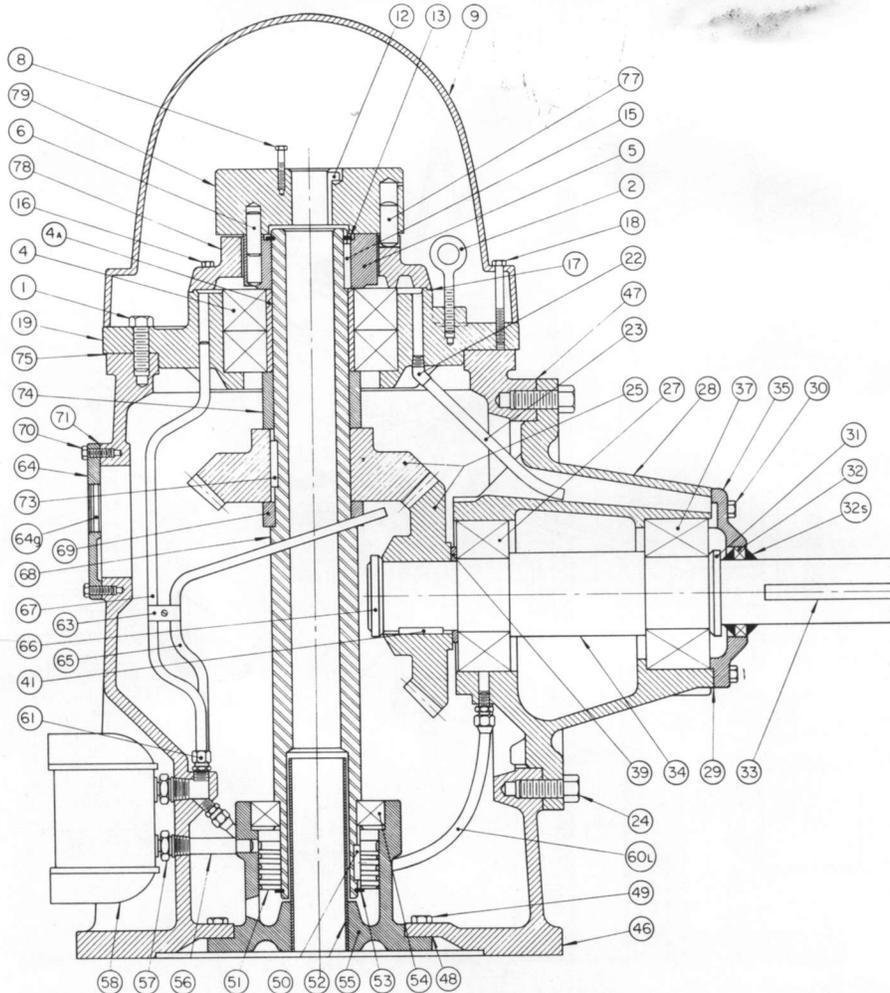
TYPICAL MODEL H-80 - H-200



No.	Part Name	No.	Part Name	No.	Part Name
1	Capscrew—Thrust Cage	29	Gasket—Horiz. Hsg. Cover	56	Oil Tube From Pump
2	Lifting Eyebolt	30	Capscrew—Horiz. Hsg. Cover	57	Cooler Flexible Fittings
4	Thrust Bearing	*31	Locknut & Washer	58	Oil Cooler
*4A	Thrust Bearing Sleeve	32	Oil Seal	60	Oil Distributor
5	Lower Coupling	*32S	Slings	60L	Oil Tube to Inner Bearings
6	Coupling Pin	33	Key	61	Compression Fittings
8	Capscrew	34	Driveshaft	63	Oil Tube Clamp
9	Dome	35	Horizontal Housing Cover	64	Inspection Plate
12	Gib Key	37	Outer Bearing	*64G	Oil Sight Glass
13	External Snap Ring	39	Horizontal M.D. Spacer	65	Oil Tube to Gears
15	Key—Lower Coupling	41	Key—Drive Gear	*66	Locknut & Washer
16	Capscrew—Thrust Cover	46	Main Housing	67	Oil Tube to Thrust Bearing
17	Gasket—Thrust Cover	47	Shim—Horiz. Hsg.	68	Hollow Shaft
18	Capscrew—Dome	50	Key—Pump Runner	*69	Lower Hollow Shaft Spacer
19	Thrust Bearing Cage	51	Pump Runner	70	Capscrew Insp. Plate
*22	Flexible Tube Fitting	52	Seal Tube	71	Gasket—Insp. Plate
*23	Flexible Tube	53	External Snap Ring	73	Key—Driven Gear
24	Capscrew—Horiz. Hsg.	54	Pump Bearing	74	Vertical M.D. Spacer
25	Gears	55P	Seal Plug	75	Shim—Thrust Bearing Cage
27	Inner Bearing			77	Ratchet Pins
28	Horizontal Housing			78	Thrust Bearing Cover
				79	Upper Clutch

* These parts are not universal and are omitted in certain ratios and models.

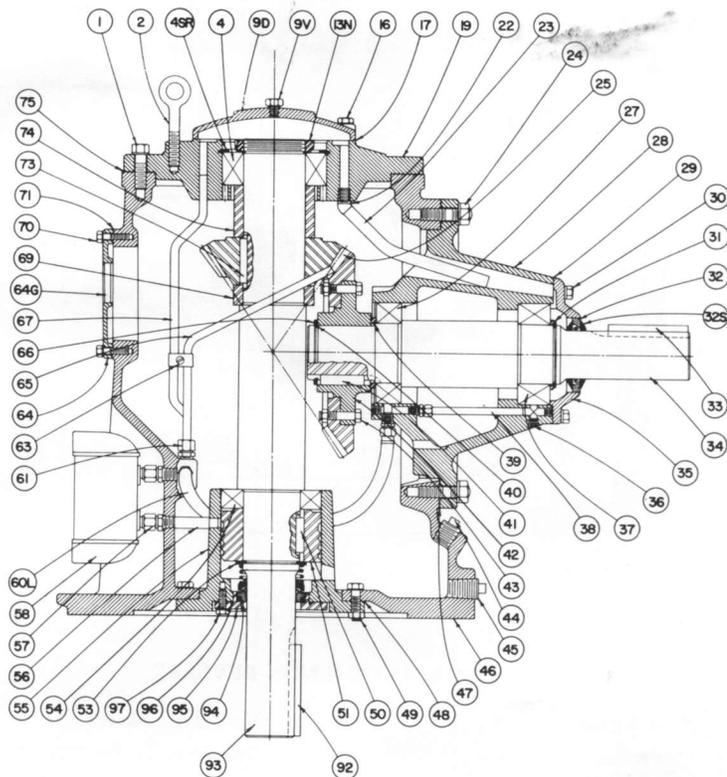
TYPICAL MODEL H-280 and LARGER



No.	Part Name	No.	Part Name	No.	Part Name
1	Capscrew—Thrust Cage	30	Capscrew—Horiz. Hsg. Cover	56	Oil Tube From Pump
2	Lifting Eyebolt	*31	Locknut & Washer	57	Cooler Flexible Fittings
4	Thrust Bearing	32	Oil Seal	58	Oil Cooler
*4A	Thrust Bearing Sleeve	*32S	Slingers	60L	Oil Tube to Inner Bearings
5	Lower Coupling	33	Key	61	Compression Fittings
6	Coupling Pin	34	Driveshaft	63	Oil Tube Clamp
8	Capscrew	35	Horizontal Housing Cover	64	Inspection Plate
9	Dome	37	Outer Bearings	*64G	Oil Sight Glass
12	Gib Key	39	Horizontal M.D. Spacer	65	Oil Tube to Gears
13	External Snap Ring	41	Key—Drive Gear	*66	Locknut & Washer
15	Key—Lower Coupling	46	Main Housing	67	Oil Tube to Thrust Bearing
16	Capscrew—Thrust Cover	47	Shim—Horizontal Housing	68	Hollow Shaft
17	Gasket—Thrust Cover	48	Gasket—Pump Housing	*69	Lower Hollow Shaft Spacer
18	Capscrew—Dome	49	Capscrew—Pump Housing	70	Capscrew—Insp. Plate
19	Thrust Bearing Cage	50	Key—Pump Runner	71	Gasket—Insp. Plate
*22	Flexible Tube Fitting	51	Pump Runner	73	Key—Driven Gear
*23	Flexible Tube	52	Seal tube	74	Vertical M.D. Spacer
24	Capscrew—Horiz. Hsg. Gears	53	External Snap Ring	75	Shim—Thrust Bearing Cage
25	Gears	54	Pump Bearing	77	Ratchet Pins
27	Inner Bearing	55	Pump Housing	78	Thrust Bearing Cover
28	Horizontal Housing Gasket—Horizontal Housing Cover			79	Upper Clutch

* These parts are not universal and are omitted in certain ratios and models.

TYPICAL SOLID SHAFT

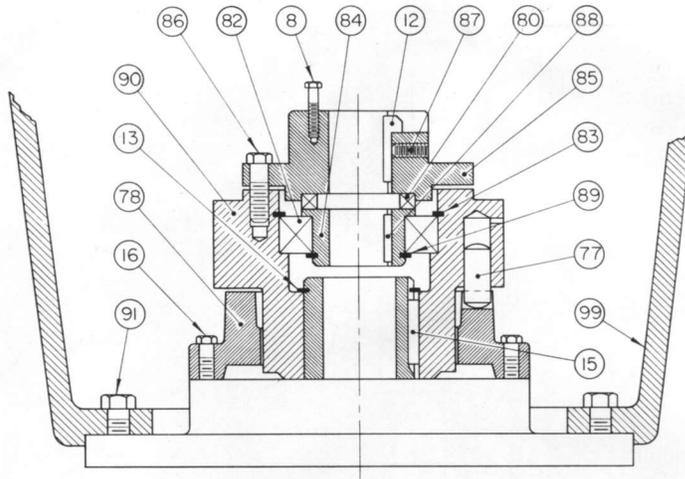


No.	Part Name	No.	Part Name	No.	Part Name
1	Capscrew	35	Horizontal Housing Cover	*57	Cooler Flexible Fittings
2	Lifting Eyebolts	36	Pipe Plugs—Hollow Head	*58	Oil Cooler
*4SR	Thrust Bearing Internal Snap Ring	37	Outer Bearing	*60L	Oil Tube to Inner Bearing
4	Thrust Bearing	*38	Oil Tube to Outer Bearing	*61	Compression Fittings
9D	Thrust Bearing Dome	*39	Gear Spacer	*63	Clamp Assembly (Oil Tubes)
9V	Vent Plug	40	Shim	64	Inspection Plate
13N	Locknut and Lockwasher	41	Key	*64G	Oil Sight Glass
16	Capscrew	*42	Drive Gear Hub	65	Oil Tube to Gears
17	Gasket—Thrust Bearing Dome	*43	Capscrew	66	External Snap Ring or Locknut & Washer
19	Thrust Bearing Cage	44	Pipe Plug	67	Oil Tube to Thrust Bearing
*22	Flexible Tube Fitting	45	Pipe Plug	*69	Driven Gear Spacer
*23	Flexible Tube	46	Main Housing	70	Capscrew
24	Capscrew	47	Shim—Horizontal Housing	71	Gasket—Inspection Plate
25	Gears	48	Gasket—Pump Housing	73	Key
27	Inner Bearing	49	Capscrew	74	Pinion Spacer
28	Horizontal Housing	50	Key	75	Shim—Thrust Bearing Cage
29	Gasket—Horizontal Housing Cover	51	Pump Runner	92	Key
30	Capscrew	53	External Snap Ring	93	Vertical Shaft
31	Snap Ring and Washer	54	Pump Bearing	94	Mechanical Seal
32	Oil Seal	*54W	Pump Bearing Spacer (Fig. 2 or 3)	95	Seal Cage
*32S	Slinger	*55	Pump Housing	*96	“O” Ring
33	Key	*56	Oil Tube from Pump	*97	Capscrew
34	Driveshaft				

*These parts not universal and are omitted in certain ratios and models. Lock washers furnished when fastening is not self-locking.

When ordering parts, the serial number, ratio, and size of drive stamped on the nameplate **MUST** be furnished.

COMBINATION



COMBINATION NON-REVERSE

<i>No.</i>	<i>Part Name</i>	<i>No.</i>	<i>Part Name</i>
8	Capscrew	84	Steady Bearing Adaptor
12	Gib Key	85	Upper Coupling Combination
13	External Snap Ring	86	Stainless Steel Capscrews
15	Key (Lower Coupling)	87	Set Screw
16	Capscrew	88	Key (Steady Bearing Adaptor)
77	Ratchet Pins	89	External Snap Ring
78	Thrust Bearing Cover	90	Lower Coupling Combination Non Reverse
80	Wave Spring	91	Capscrew
82	Steady Bearing	99	Motor Stand
83	Internal Snap Ring		

LUBRICATION RECORD

Date	Estimated Hrs. Operation	Oil Changed	Oil Added	Trade Name

USE ONLY APPROVED OILS

Serial No. _____

Model _____

Ratio _____

_____ BHP at _____ RPM of vertical shaft

This manual contains information which will assist you to obtain the maximum service. Keep it readily available for reference in the event any question arises as to the proper care of your right angle gear drive.

Communications with your dealer or the manufacturer having reference to your gear drive, should state the SERIAL NUMBER and approximately how long the drive has been operated.

Filed under the SERIAL NUMBER, Johnson Right Angle Gear Drive keeps complete data on every gear drive manufactured. This service is maintained for the customer so that replacement parts can be furnished by the factory to fit each individual drive, once the serial number is known. The SERIAL NUMBER and rating of each drive is stamped on the nameplate fastened to the inspection hole coverplate. If the nameplate is missing or illegible remove the inspection coverplate and gasket. The SERIAL NUMBER is stamped on the machined surface of the inspection opening of the main housing.

WARRANTY

1. The Johnson Right Angle Gear Drive is warranted to be free from defects in material and workmanship under normal use and service for a period of one year from the date of factory shipment by us for the original purchaser and then only when operated within the rated capacity for which it was sold and in accordance with recognized usage and practice. Our obligation under this warranty is limited to the replacement of any part or parts which shall be returned to us with transportation charges prepaid, within one year after shipment for the original purchaser; and, which it is determined by the company, to have proven defective under normal and proper use. This warranty shall not apply to any drive which shall have been altered or repaired outside our factory without our written consent and approval, nor any drive which has been subject to misuse, neglect, accident, improper oiling or mounted on foundations which are not vibration proof.

2. We make no warranty of any kind

whatever, express or implied, in regard to bearings, trade accessories, machinery, or other articles of merchandise not manufactured by us. The bearings which we have selected for the thrust position will cover most installations, but there are many cases which will require special treatment.

3. No warranty or guarantee is binding upon the company and no asserted breach thereof can be claimed against the company unless the company has been notified in detail and in writing of any alleged defect within seven (7) days after the discovery thereof.

4. The express warranties and guarantees contained herein are exclusive and are made in lieu of any other representation by the company or its agents, and any implied warranty of Merchantability or Fitness for a Particular Purpose are hereby expressly disclaimed. It is agreed that the language contained herein shall be the final and exclusive expression of the agreement with respect to sale of equipment by the company.



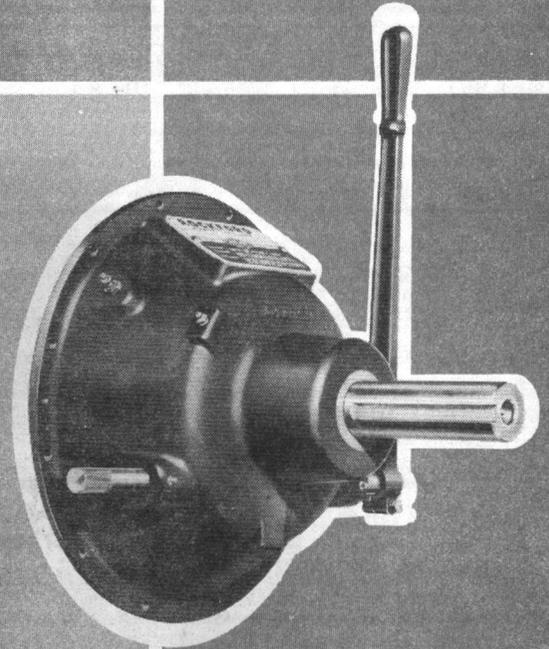
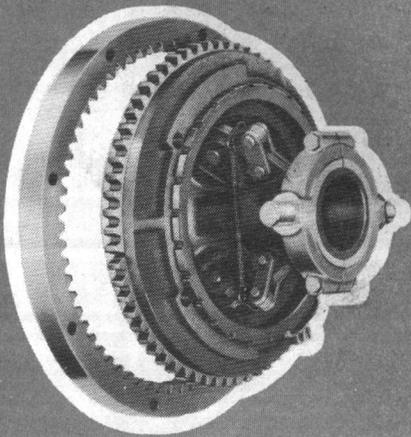
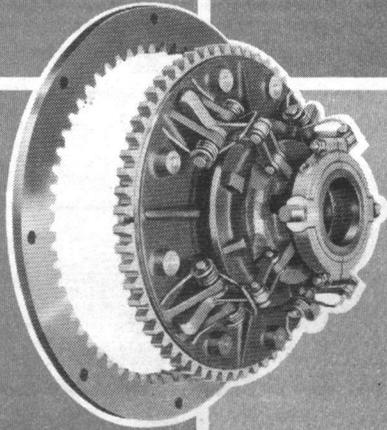
JOHNSON

RIGHT ANGLE GEAR DRIVE

A Division of Arrow Gear Company

Sales Office and Manufacturing Plant:
1401 West Bond Circle, Lincoln, NE 68521 U.S.A.
Phone: (402) 474-5285 Telex: 48 4307

**OPERATING
AND
MAINTENANCE
INSTRUCTIONS**



ROCKFORD POWER TAKE-OFFS

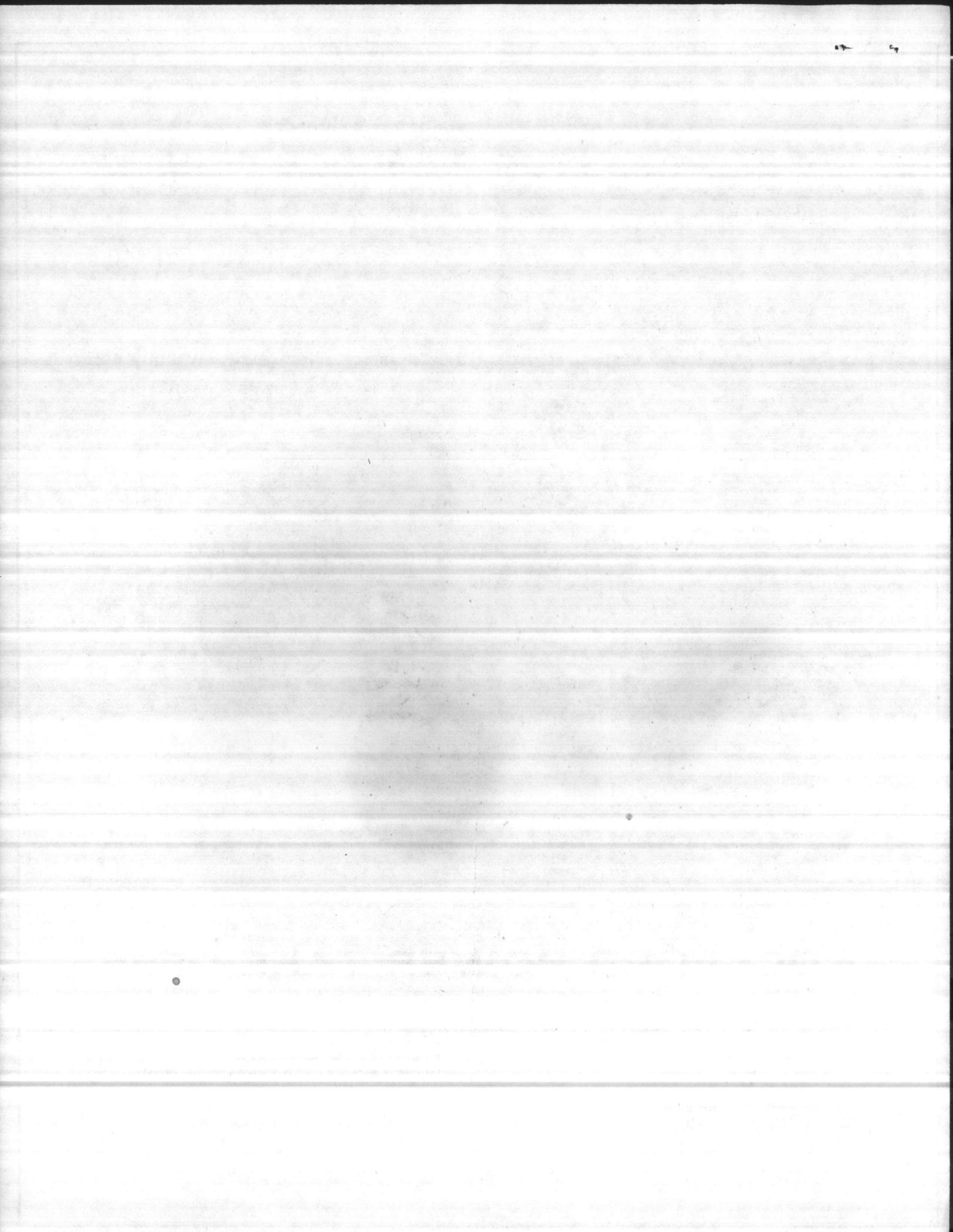
Rockford Division
(Formerly Rockford Clutch & Mechanics Divisions)

BORG WARNER® Transportation
Equipment

PRICE — \$1.00

Borg-Warner Corporation
1200 Windsor Road, Rockford, Illinois 61101
Telephone 815/633-7460

European Office: A. G. Building
Place du champ de Mars, 5, B-1050 Brussels, Belgium
Telephone: (02) 13-68-30, Telex: 23563



INTRODUCTORY SECTION

CARE AND OPERATION OF ROCKFORD POWER TAKE-OFF

The following brief instructions are a simple outline of duties that the owner and operator must perform for long and satisfactory service from any Rockford Power Take-Off.

ADJUSTMENT

CLUTCH If the clutch does not pull, overheats, or the clutch operating lever jumps out, the clutch must be adjusted. To adjust the clutch remove the hand hole plate in the housing and rotate the clutch until the adjusting lock and lock screw can be reached. Remove or disengage the adjustment ring lock.

HE CLUTCH Turn the adjusting ring counter clockwise to obtain recommended operating lever pressure. (See page A-3)

HD CLUTCH Turn the adjusting ring clockwise to obtain recommended operating lever pressure. (See page C-3)

A new clutch generally requires several adjustments until the friction surfaces are worn in. Do not let a clutch slip as this will glaze the friction plates and may ruin them.

BEARINGS Power Take-Offs with ball type shaft bearings do not require bearing adjustment.

The approved method for field adjustment of tapered roller bearings in Rockford Power Take-Off units is by use of a dial indicator to measure actual shaft end play.

Adjust tapered roller bearings as follows: For units with the bearing retainer inside the unit housing, page (A-3), remove the housing hand hole plate. Remove the retainer lock.

1. Tighten retainer to firmly seat both bearings. Mark notch for reference.
2. Back off bearing retainer three or four notches.
3. Tap output end of shaft with soft hammer to seat bearing cup against bearing retainer. This should be the approximate end play required.
4. Measure actual end play with a dial indicator.
5. Indicator readings should be taken with the indicator anchored to the housing and the indicator tip resting on the end of the shaft. Hold housing firmly and pry shaft axially in and out to get indicator reading.

6. Adjust bearing retainer until measured end play is within limits given on page (3), Table 4.

7. Lock bearing retainer.

Bearing adjustment for units with external bearing retainers is the same except for item 3.

3. Tap shaft on pilot bearing end with soft hammer to seat bearing cap against bearing retainer. This should be approximate end play required.

LUBRICATION

LUBRICANT Any high grade, Lithium Base #2, short fiber grease having an operating temperature of 200° F recommended for roller bearings may be used.

CAUTION

Do not mix Sodium or Calcium base grease with Lithium grease.

THROWOUT COLLAR Apply one or two shots of lubricant each day before starting or after each 8 hours of operation. Do not over grease.

ANTI-FRICTION BEARINGS Shaft bearings should be lubricated after each 50 hours of operation through fittings, page (C-3) with a short fiber, high grade, high temperature, Lithium Base #2 lubricant having an operating temperature of 200° F.

CLUTCH LEVERS AND LINKAGE Levers and linkage should be lubricated with engine oil after every 500 hours of operation.

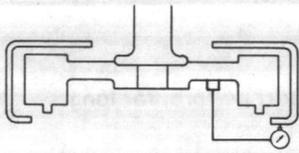
LUBRICATE SPARINGLY TO AVOID OIL
ON CLUTCH FACINGS.

INSTALLATION OF POWER TAKE-OFF

Avoid jamming, excessive wear or scrubbing of parts. Also misalignment between engine and power take-off. The following checks must be part of standard installation procedure.

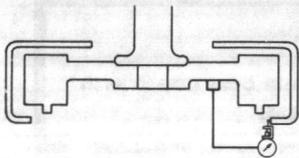
1. Excessive side loading tends to deflect the drive shaft and parts to which Power take-offs are mounted. Deflection under actual operating conditions may be determined by mounting a dial indicator on a rigid part of the engine, or mounting it independently on the foundation. Readings should be taken before the drive is installed, and then again under actual running and load conditions. Total deflection on the output shaft, next to the bearing housing must not exceed .010.
2. To check concentricity of the flywheel housing bore and the alignment of the flywheel housing face, a dial indicator should be attached as shown in the following figures. All measurements should be taken as the engine would be mounted in operation, after thoroughly cleaning flywheel and housing.

FLYWHEEL HOUSING FACE CHECK



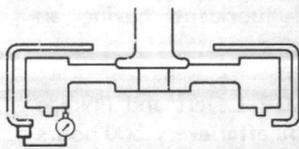
MOUNT INDICATOR TO FLYWHEEL SO THAT INDICATOR DIAL IS PERPENDICULAR TO HOUSING FACE AND INDICATOR STEM CONTACTS THE FACE OF THE HOUSING. RUN OUT MUST NOT EXCEED TOLERANCE IN TABLE.

FLYWHEEL HOUSING BORE CHECK



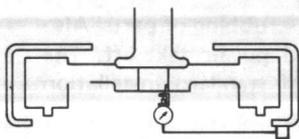
LEAVE INDICATOR MOUNTED ON FLYWHEEL AND READJUST INDICATOR SO THAT STEM CONTACTS THE BORE OF THE FLYWHEEL HOUSING. RUN OUT MUST NOT EXCEED TOLERANCE FROM TABLE.

FLYWHEEL FACE CHECK



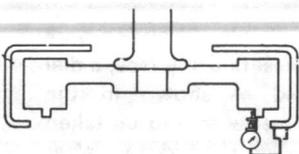
MOUNT INDICATOR BASE TO FLYWHEEL HOUSING. SET INDICATOR PERPENDICULAR TO THE FLYWHEEL FACE WITH INDICATOR STEM CONTACTING FACE OF THE FLYWHEEL. FACE RUN OUT OF THE FLYWHEEL SHOULD NOT EXCEED .0005 TIR PER INCH DIAMETER OF FACE.

PILOT BEARING BORE CHECK



LEAVE INDICATOR BASE MOUNTED ON THE FLYWHEEL HOUSING. ADJUST INDICATOR SO THAT STEM OF INDICATOR CONTACTS BEARING BORE CAVITY. ECCENTRICITY OF PILOT BEARING BORE MUST NOT EXCEED .005 TIR.

DRIVE RING BORE CHECK



RE-ADJUST INDICATOR SO THAT STEM CONTACTS THE DRIVING RING BORE ECCENTRICITY OF DRIVING RING BORE. MUST NOT EXCEED .005 TIR.

NOTE

When flywheel face and flywheel housing face readings are taken, the flywheel and crankshaft must be held against either the forward or rear thrust washer and maintained during the complete revolution.

TABLE 1

MAXIMUM FLYWHEEL HSG. DEVIATION

HOUSING SIZE S.A.E. NO.	A FACE DEVIATION TIR INCHES	B BORE ECCEN. TIR INCHES
00	.012	.012
0-1/2	.010	.010
1-2-3	.008	.008
4-5-6	.006	.006

TABLE 2

MAXIMUM FLYWHEEL DEVIATION

NOMINAL CLUTCH DIA. INCHES	A FACE DEVIATION TIR INCHES	B DRIVING RING PILOT & PILOT BRG. BORE TIR INCHES
8	.005	.005
10	.006	.005
11-1/2	.009	.005
14 (18-3/4 Bore)	.009	.005
14 (22-1/2 Bore)	.011	.005
18	.011	.005

HANDLE PRESSURE

Variation in handle length directly affects the pressure required at the handle for proper clutch adjustment. See table below to determine correct handle pressure:

TABLE 3

CLUTCH SIZE	REFERENCE HANDLE LENGTH	PRESSURE AT HAND GRIP
7"	15-1/2"	39-44#
8"	15-1/2"	50#-65#
10"	20"	60#-70#
11-1/2" SP	20"	60#-70#
11-1/2" DP	25"	65#-75#
14" SP	20"	80#-90#
14 DP	25"	85#-95#

HANDLE PRESSURE FOR ALTERED HANDLE

If the handle has been altered in your application use the following formula to calculate altered handle engagement pressure:

Reference Handle Length = RHL (See Chart)

Altered Handle Length = AHL

Actual Handle Pressure = RHP (See Chart)

Altered Handle Pressure = AHP

Example: Using 10" clutch size

$$\frac{RHL \times RHP}{AHL} = AHP$$

$$\frac{[RHL(20'') \times RHP(65\#)]}{AHL} = AHP$$

Example: AHL = 10"

$$\frac{RHL \times RHP}{AHL} = \frac{20'' \times 65\#}{10''} = AHP = 130 \# \text{ At Handle}$$

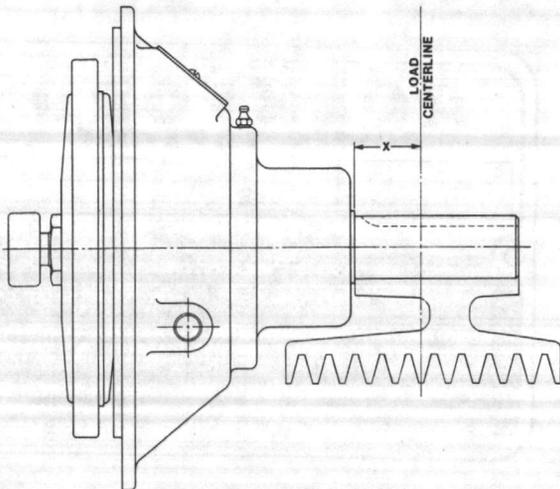
HANDLE POSITION

Position the handle in a vertical position (pointing up or down) so as to prevent its weight from causing a pre-load on the bronze release bearing. A pre-load (forward or rearward) with the clutch engaged or disengaged will cause failure.

SHAFT END PLAY

STANDARD CHART	
CLUTCH SIZE	END PLAY
8"	.004 - .006
10"	.004 - .006
11-1/2"	.004 - .006
14"	.006 - .009

SIDE PULL LOADS



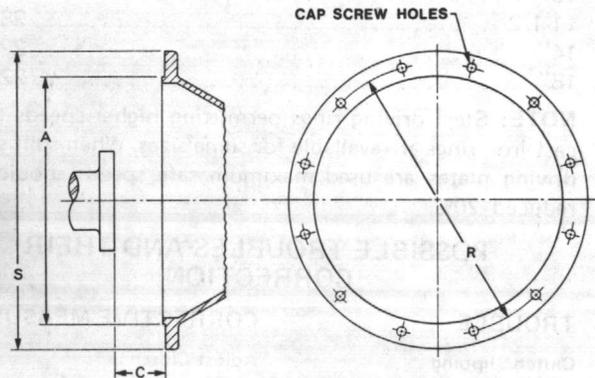
To calculate the actual applied side pull load on the output shaft, the following formula can be used:

$$L = \frac{126000 \times H.P. \times F}{N \times D}$$

Where L = actual applied load (lbs.)
 N = shaft speed (Rev./Min.)
 D = pitch diameter of sheave, etc.
 F = load factor
 1.0 for chain or gear drive
 2.5 for V belt drive
 3.5 for flat belt drive
 X = distance, in inches, at which the centerline of the load is located from the nearest point on the housing.

Maximum side load for any given power take-off will be furnished on request. Contact Rockford Clutch engineering department.

S.A.E. HOUSINGS



NO.	A	S	R	C	CS NO.	HOLES SIZE
00	31.000	34.75	33.500	3.94	16	.531
0	35.500	28.00	26.750	3.94	16	.531
1	20.125	21.75	20.875	3.94	12	.469
2	17.625	19.25	18.375	3.94	12	.406
3	16.125	17.75	16.875	3.94	12	.406
4	14.250	15.88	15.000	3.94	12	.406
5	12.375	14.00	13.125	*	8	.406
6	10.500	12.12	11.250	2.81	8	.406

*Refer to specifications for dimensions.

TORQUE AND HORSEPOWER

As the capacity of a clutch is based on the transmitted torque, the following formula is used for converting H.P. and R.P.M. into inch lbs. torque, or vice versa.

$$\text{Torque (inch lbs.)} = \frac{\text{HP } 63025}{\text{RPM}}$$

$$\text{Torque (foot lbs.)} = \frac{\text{HP } 5252.1}{\text{RPM}}$$

$$\text{HP} = \frac{\text{Torque (inch lbs.) RPM}}{63025}$$

$$\text{HP} = \frac{\text{Torque (foot lbs.) RPM}}{5252.1}$$

Derivation

$$63025 = \frac{33000 \times 12}{2 \times 3.1416}$$

$$5252.1 = \frac{33000}{2 \times 3.1416}$$

MAXIMUM SAFE SPEEDS:

CLUTCH SIZE	R.P.M.
6-1/2"	3700
7-1/2"	3400
8"	3250
10"	3000
11-1/2"	2800
14"	2200
18"	2200

NOTE: Steel driving rings permitting higher speeds than cast iron rings are available for some sizes. When split steel driving plates are used maximum safe speeds should be reduced 20%.

POSSIBLE TROUBLES AND THEIR CORRECTION

TROUBLE	CORRECTIVE MEASURE
Clutch Slipping	Adjust Clutch
Clutch Self engages	Check adjustment. Check for worn linkage and release collar.
Clutch will not release	Check for broken or frozen pilot bearing.
Output shaft bearings running hot	Check bearing adjustment, belt tension, over supply of lubricant.
Excessive uneven tooth wear of driving plate	Check flywheel and housing alignment.
Output Shaft breakage	Check alignment, overhang and drive loads.
Pilot bearing failure	Check alignment and lubrication.
Grease soaked facings	Replace or wash with chlorethene or equivalent. Have adequate ventilation when using carbon tet.

REMOVAL OF PTA FROM THE ENGINE

1. Remove all attached parts such as guards, belts, and drive components. Remove the drive key and grease fitting from the output end of the shaft.

NOTE: Not all power take-offs will have a grease fitting in the output end of shaft.

Engage clutch operating handle to hold clutch facings in place, when removing PTA from engine.

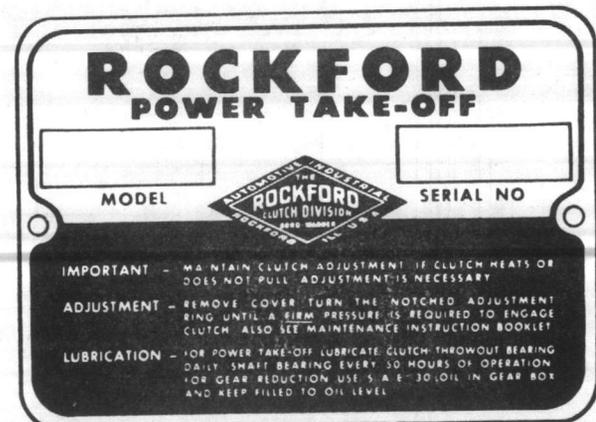
2. Attach a suitable lifting device to the power take-off. Remove the hex-head cap screws that secure the power take-off housing to the flywheel housing.

CAUTION should be exercised when removing the power take-off from the engine so that the facings and pilot bearing are not damaged.

3. Support the power take-off on blocks with output end of the shaft down.
4. Remove the (2) screws (T4) and name plate (T2) from the power take-off housing (T1).
5. Remove the Jam nut (T6) from the grease hose fitting (T32). Push grease hose to inside of power take-off housing.

DRIVE PLATE REPLACEMENT ONLY A common indication that friction surface is worn out is that the adjusting ring cannot be turned any tighter.

1. Remove all accessory components that would prevent Power Take-Off removal from engine.
 2. Remove bell housing to fly wheel housing bolts.
 3. With suitable lifting device remove Power Take-Off from engine.
 4. In replacing segmented facings the clutch assembly need not be removed from the shaft.
 5. If replacing molded whole ring or steel plate type facings the clutch must be removed from the shaft and disassembled.
- Follow clutch adjustment procedure from page (1).



REPAIR PARTS

When ordering repair parts always refer to the model and serial numbers that are listed on the instruction plate which is attached to the housing flange. In the event no number is available, describe the part in detail or any associated parts which might help to identify the part required. A current parts list may be obtained from the offices of Rockford Clutch Division, Rockford, Illinois, by referring to the model number.

Most Power Take-Offs incorporate the gear tooth type clutch. Some incorporate the over-center cam type clutch and a few have the spring-loaded type clutch. The latter type is used for foot pedal applications.

DECODING OF MODEL NUMBER

Example: PTA-1157-TT

PTA - Power Take-off

1 - SAE Housing No. 1

15 - Clutch Diameter.

7 - Our Engineering Number.

TT - Denotes Spring-Loaded Clutch

Example - PTA-21118:

PTA - Power Take-off

2 - SAE Housing No. 2

11 - Clutch Diameter.

18 - Our Engineering Number.

If a suffix "D" appears after number, this designates a double-plate clutch.

If possible always give model number and serial number shown on instruction plate when ordering parts.

WARRANTY

All orders are accepted subject to Warranty of Rockford Clutch Division of Borg-Warner Corporation as follows:

Manufacturer warrants new Rockford Clutch Division products to be free from defects in material or workmanship under normal use and service. The manufacturer's obligation under this warranty is limited to making good at its factory any part or parts of such products which shall be returned to it with transportation charges prepaid within six (6) months from date of delivery of said products to the original purchaser (but not to exceed ninety (90) days of service), and which its examination shall disclose to its satisfaction to have been thus defective.

This warranty is in lieu of all warranties, expressed or implied, and all other obligations and liabilities on its part, and it neither assumes nor authorizes any person to assume for it any other liability in connection with its products.

This warranty shall not apply to any part which shall have been repaired or altered by anyone not in the employ of the Rockford Clutch Division in any way so as in the judgment of the manufacturer to affect its stability and reliability nor which has been subject to misuse, negligence or accident.

SECTION A

DISASSEMBLY OF HE CLUTCH

(SEE EXPLODED VIEW PAGE A-3)

REMOVAL OF CLUTCH FROM SHAFT

1. Bend lock tab on lock (T27) away from nut (T26).
2. Remove nut (T26) and lock (T27).
3. Remove clutch from shaft as follows:
Place prybars at opposite side of the clutch housing and behind pressure plate. Exert pressure outward (away from the roller bearings), rap pilot end of the shaft sharply with soft hammer to jar clutch assembly off the taper of the drive shaft.

DISASSEMBLY OF HE CLUTCH

1. Remove clutch release lever (holdback) spring (H12) from clutch release sleeve.
 2. Match mark each half of release sleeve collar (H23) to assure that they will be assembled in their same relative position.
 3. Remove the two nuts and bolts holding the collar (H23) together, then remove collar from release sleeve (H22).
 4. Remove retaining rings (H34) from pins (H33). Remove pins (H33) from links (H30) and levers (H13).
 5. Remove retaining rings (H15) from pins (H14) that connect release levers (H13) to the bosses on the clutch body (H1). Remove pins and levers from clutch body. Note the direction the heads of the link to release sleeve and release lever to pressure plate pins are facing before removing so they may be installed in the same direction as they were removed.
 6. Remove the adjusting ring lock retaining bolt (H17) lock washer (H18) and lock (H19) from pressure plate (H3).
 7. Remove clutch adjusting ring (H9) by turning COUNTER-CLOCKWISE out of the clutch pressure plate.
 8. Lift clutch pressure plate (H3) straight up, off bosses of clutch body (H1).
 9. Remove the three clutch pressure plate separator springs (H36) from holes in clutch body.
- Rough or sticking spots of the bearings are cause to reject the bearings from further use.
2. **CLUTCH FACINGS** Examine the clutch FACINGS for being scored, burned or cracked; inspect driving TEETH for wear or damage and measure thickness of the facings. Replace any clutch facing that is badly scarred, burned, or has driving teeth which are worn and/or damaged, or if the facing thickness is worn to under 5/16 of an inch.
 3. **PRESSURE PLATES** Inspect the FRICTION SURFACES on the clutch body and pressure plate for being flat, smooth, and free from cracks and heat checks. The drive BOSSES and KEYWAY of the clutch body, and the adjusting ring THREADS and boss NOTCHES of the pressure plate should be examined for wear, and if worn excessively, should be replaced.
 4. Inspect the INNER FACE and THREADS of the adjusting ring for wear or damage. If worn excessively, replace adjusting ring.
 5. **PINS AND PIN HOLES** Examine all lever and link pins and pin holes in links, release levers, release sleeve and pressure plate for wear. If pins and pin holes in parts are worn excessively, parts must be replaced.
 6. **LOCK** Inspect the FINGERS of the adjusting ring lock for wear. Replace lock if fingers are worn excessively or have been damaged. Lock must have sufficient tension to hold adjusting ring from turning when clutch is operating.
 7. **CLUTCH RELEASE SLEEVE & COLLAR** Examine the WEARING SURFACE of release sleeve collar and mating surface on release sleeve. If parts show excessive wear, they must be replaced.
 8. **CLUTCH RELEASE YOKE** Inspect the surface of the clutch release yoke fingers and mating TRUNNIONS on the release sleeve collar for wear. If parts are worn excessively, they must be replaced.
 9. **CLUTCH DRIVE SHAFT** Examine threads, keyways, and pilot bearing surface of drive shaft.
 10. **SEPARATOR SPRINGS** Check the pressure plate separator springs for being broken or weak. Approximate spring pressure is 15 to 20 lbs. with spring compressed to 13/16 of an inch.

INSPECTION

Wash all parts of the Power Take-Off EXCEPT the CLUTCH FACINGS in clean fuel oil or a good solvent, then, blow dry before inspection.

1. **BALL AND ROLLER BEARINGS** Examine CUPS, RACES, BALLS, and ROLLERS for indications of corrosion or pitting. Apply light engine oil to the bearings; then, while holding the inner race, revolve the bearing and outer race slowly to check for free rolling of the balls or rollers on the races and cup.

ASSEMBLY OF CLUTCH

With all the clutch parts cleaned and inspected and necessary parts on hand, the Power Take-Off may be reassembled as outlined in the following:

CLUTCH ASSEMBLY Having cleaned, inspected, and replaced all worn parts, assemble clutch as follows:

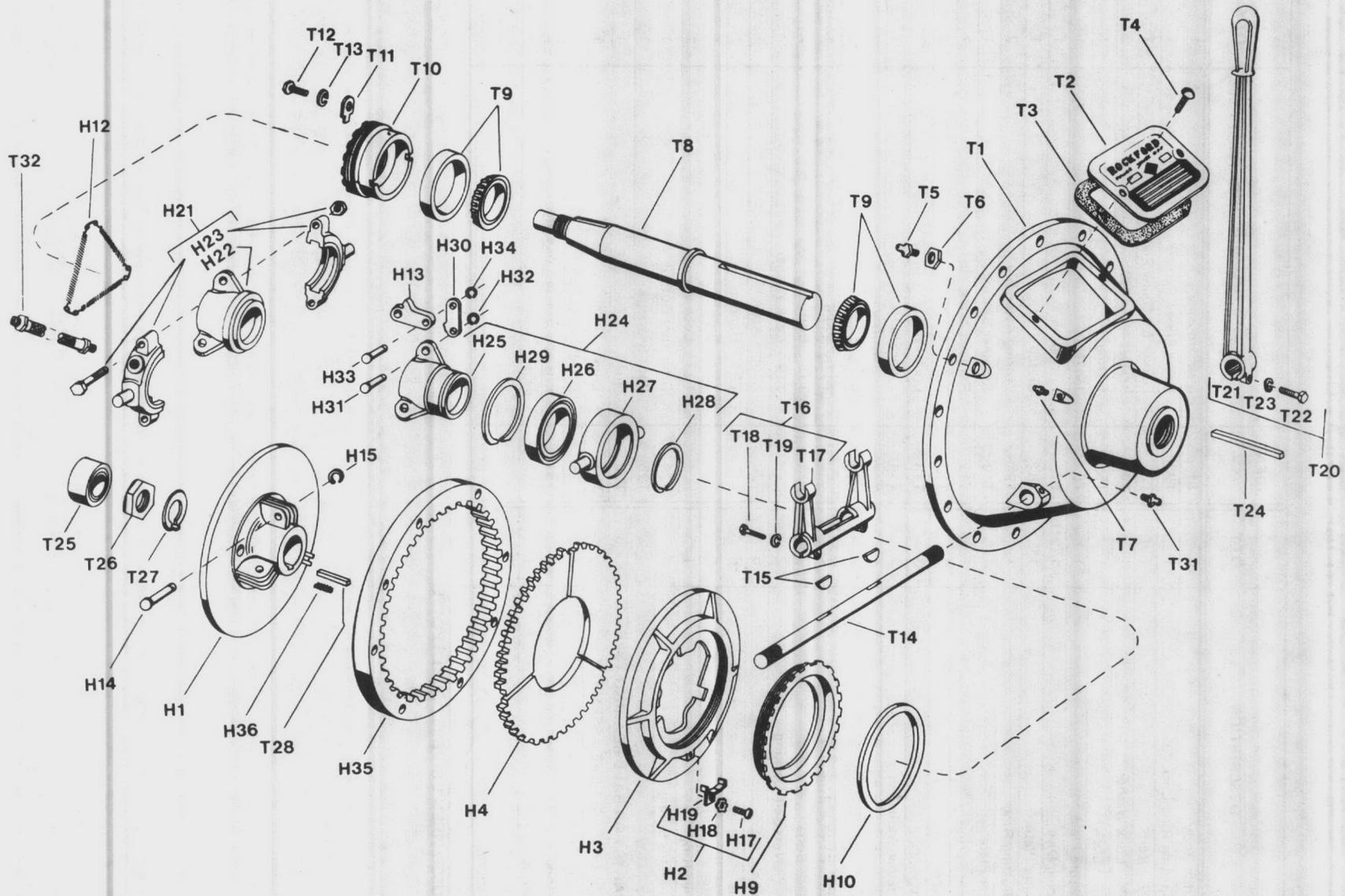
1. Place the clutch body (H1) on workbench with hub end (release lever bosses) of pressure plate up.

**EXPLODED VIEW HE
& PTA HOUSING**

PART IDENTIFICATION

IDENT. NO.	DESCRIPTION	QTY.	IDENT. NO.	DESCRIPTION	QTY.
H1	Clutch Body	1	T1	Main Housing	1
H2	Adjusting Ring Lock Assy.	1	T2	Name Plate	1
	H17 Bolt	1	T3	Gasket for Name Plate	1
	H18 Lock Washer	1	T4	Screws 1/4 x 7/8	2
	H19 Lock	1	T5	Fitting	1
H3	Pressure Plate	1	T6	Jam Nut	1
H4	Facing Disc	1 (2*)	T7	Fitting	1
H5	Center Plate	1*	T8	Clutch Shaft	1
H9	Adjusting Ring	1	T9	Bearing Assembly	2
H10	Wear Plate	1	T10	Retainer Bearing	1
H12	Lever Spring	1	T11	Retainer Lock	1
H13	Lever	3	T12	Bolt 1	1
H14	Pin	3	T13	Lock Washer	1
H15	Retainer Washer	3	T14	Yoke Shaft	1
H21	Release Sleeve & Bearing Assy.	1	T15	Woodruff Key	2
	H22 Release Sleeve	1	T16	Yoke Assy.	1
	H23 Release Brng. 1/2	2		T17 Yoke	1
	Bolts	2		T18 Bolt	2
	Nuts Self Locking	2		T19 Lock Washer	2
H30	Links	6	T20	Handle Assy.	1
H31 & H33	Pins	6		T21 Handle	1
H32 & H34	Retainer	6		T22 Bolt	1
H35	Drive Ring	1		T23 Lock Washer	1
H36	Seperator Spring	3	T24	Drive Key Output	1
OPTIONAL - PARTS FOR BALL BEARING TYPE RELEASE SLEEVE ASSEMBLY			T25	Pilot Bearing	1
			T26	Nut	1
			T27	Lock	1
			T28	Drive Key Clutch	1
H25	Release Sleeve	1	T31	Fitting - Grease Yoke Shaft	2
H26	Bearing	1	T32	Hose - Grease to Collar	1
H27	Bearing Carrier	1			
H28	Snapping	1			
H29	Snapping	1			
H24	Complete Sleeve & Bearing Assy.	1			

NOTE * USED WHEN DRIVE IS DOUBLE PLATE



**EXPLODED VIEW HE
& PTA HOUSING**

2. Place clutch pressure plate separator springs (H36) in holes provided in plate next to release lever bosses. Note: If whole ring facing is to be used it must be installed at this time.
3. Place the pressure plate (H3) on top of the clutch body (smooth face down) with notches in pressure plate in line with the release lever bosses of the clutch body, then lower pressure plate down on the three pressure plate separator springs (H36).
4. Lubricate threads on clutch adjusting ring (H9) and turn it CLOCKWISE into pressure plate (H3) until it bottoms.
5. Install clutch release levers (H13) in opening of bosses or clutch body (H1) with notch end of lever up and out.

NOTE

Determine the direction the clutch will rotate when attached to the engine, then install lever pins (H14) with the heads of the pins leading the rotation of the clutch.

CAUTION

Be sure retaining rings (H15) are securely locked on pins (H14).

6. Align holes in levers (H13) with holes in bosses of outer plate then insert pins (H14) through pin holes and secure with retaining rings (H15).
7. Heeding the match marks previously placed on the two halves, lubricate inside diameter of clutch release sleeve collar (H23). Place the two halves together over the shoulder on release sleeve (H22) with machined side of collar down and secure them together with two bolts and nuts. Rotate collar on sleeve to check for free turning. If collar binds on sleeve, it may be necessary to shim between the collar halves to allow running clearance.

CAUTION

Be sure that the tapped hole in release sleeve is facing grease tube when assembled in Power Take-Off.

8. Place clutch release lever (holdback) spring (H12) over end of release sleeve (H22) and up against release collar before installing links (H30) to release sleeve (H22).
9. Place one release lever link (H30) on each side of each hole on clutch release sleeve (H22) with triangular end of release lever link at release sleeve and point of triangle facing toward center of release sleeve.
10. Attach links to release sleeve with link pins (H31) and retaining rings (H32).
11. Place the clutch release sleeve (H22), with other parts assembled, down on clutch with each pair of release links (H30) astride release lever (H13).

CAUTION

When installing pins, all pins must be installed with head leading rotation.

Connect links to levers with pins (H33) and retaining rings (H32).

NOTE

Be sure retaining rings (H32) are securely locked on pins (H33).

12. With the clutch release links (H30) and release levers (H13) connected, slide clutch release lever (holdback) spring (H12) over ends of release lever links and into place on release levers (H13).
13. Insert the clutch facings (H4) (three segments) in between the clutch body (H1) and pressure plate (H3), and center.
14. Lock clutch facings between the pressure plates as follows:
 - A. With the clutch assembly resting on workbench, turn the clutch adjusting ring (H9) COUNTER-CLOCKWISE until pressure plate (H3) almost contacts clutch facing (H4).
 - B. Place clutch driving ring over clutch facings with teeth in driving ring in mesh with teeth of clutch facings, and locate the driving ring centrally relative to the pressure plate and clutch body.

NOTE

If driving ring is not properly located relative to pressure plate and clutch body, the clutch cannot be assembled to the flywheel as the teeth of clutch facings will not enter the teeth of driving ring even though the clutch drive shaft enters the pilot bearing.

- C. Engage the clutch by applying pressure on top of release sleeve and collar assembly and lock clutch facings between the pressure plate and clutch body. If clutch facings are still free to move, disengage the clutch and turn adjusting ring COUNTER-CLOCKWISE just enough to lock the clutch facings in place when clutch is engaged.

NOTE

The clutch must now be kept engaged until the Power Take-Off assembly is attached to engine.

15. Remove clutch driving ring (H35) from the clutch facings and attach it to the flywheel with the specified bolts and lock washers.

(For Assembly See Section D Page D1)

SECTION B DISASSEMBLY OF TAPER ROLLER BEARINGS AND INTERNAL ADJUSTMENT

(SEE EXPLODED VIEW PAGE C-3)

DISASSEMBLY OF TAPER ROLLER BEARING AND INTERNAL ADJUSTMENT

1. With the Power Take-Off housing supported on blocks, use a standard bearing puller and remove the pilot bearing from the clutch shaft.
2. Straighten the tang on lock washer (T27). Hold clutch and shaft, remove clutch shaft nut (T26).
3. Remove the clutch from the clutch shaft (T8) as follows:
 - Place Prybars at opposite sides over the housing and back of the clutch pressure plate. Hold pressure on both bars and rap the pilot bearing end of the shaft sharply with a babbitt hammer to free clutch from shaft.
4. Remove clutch and drive key (T28) from drive shaft (T8).
5. Loosen clamp bolt (T22) and remove operating handle (T20) from cross shaft (T14).
6. Loosen the (2) bolts (T18) in yoke (T17).
7. Slide yoke left or right on the cross shaft to expose woodruff keys (T15).
8. Remove woodruff keys (T15) from cross shaft (T14).
9. Withdraw shaft (T14) from yoke (T17) and housing (T1).
10. Remove bearing retainer lock bolt (T12) and lock (T11).
11. Remove bearing retainer (T10). To remove rotate counter clockwise.
12. Remove the clutch shaft from the front of the housing. Tap the output end of the shaft if the bearing cup sticks in the housing.
13. The cup of the rear roller bearing will remain in the housing after the clutch shaft has been removed.

Note

Turn the housing face down.

14. There are three holes* provided at the rear of the housing for removal of the rear bearing cup. Insert a punch in the holes and tap alternately at three points. Avoid cocking and cramping the bearing during removal.
15. Wash the bearings thoroughly with clean fuel oil or solvent. Blow dry with compressed air and examine for wear, corrosion or rough spots. If it is determined that the bearings are unsatisfactory for further use they must be removed from the clutch shaft as follows:
 - A. Place a split type bearing remover between the two roller bearings.
 - B. Place clutch shaft and bearing removed on bench press and push bearing from the shaft.
 - C. Invert the shaft in the press and remove the other bearing in the same manner.

(For Assembly See Section D Page D1)

***NOTE: On some housings these three holes may be plugged with screws.
Remove screws and proceed per above instructions.**

SECTION C DISASSEMBLY OF HD CLUTCH

(SEE EXPLODED VIEW PAGE C-3)

DISASSEMBLY OF HD CLUTCH

1. Bend lock tab on Lock T27 away from Nut T26.
2. Remove Nut T26 and Lock T27.
3. The clutch body has two tapped holes to aid in pulling the clutch assembly off the shaft.
4. Place clutch with release sleeve up on suitable workbench.
5. Remove Retainer Rings H34 from Clevis Pins H33.
6. Remove Clevis Pins H33 from Links H30 and Lever H13. Lift complete sleeve assembly from clutch assembly.
7. Release Adjustment Lock H19.
8. Remove Adjustment Ring Assembly H8 by rotating adjustment ring counter clockwise.
9. To remove Levers H13, remove Retainer Rings H15 and Clevis Pins H14.
10. Remove Lever Spring H12.
11. Lift Pressure Plate H2 from Clutch Body H1.
12. If clutch is 2 plate assembly remove Center Plate H7.

Single and double plate assembly will be the same with exception of 2 drive plates and a center plate in the double plate clutch assembly.

All parts of clutch assembly EXCEPT the FACINGS should be washed in solvent or clean fuel oil.

INSPECTION OF CLUTCH PARTS

Inspect all clutch parts to include facings as listed.

1. Facings should be inspected for wear on the driving teeth and burning or scoring of the friction surfaces. Replace charred or badly scored facings.
2. Pressure plate, center plate and clutch body friction surfaces should be smooth and free of heat checks and cracks. The drive bosses of the splines of the clutch body and pressure plate should be free from notches and worn spots. Threads of the adjusting ring and clutch body must be checked for excessive wear. Replace any or all parts that are badly worn.
3. Inspect all lever, toggle pins and pin holes. If worn, out of round, replace.
4. Inspect adjusting lock for wear. Lock must have sufficient spring tension to hold adjustment ring in place.
5. Inspect release sleeve and mating surface of release bearing for wear. Release bearing must turn free when bolted to release sleeve.

ASSEMBLY OF HD CLUTCH

Having inspected all parts, follow exploded view drawing for relative parts location and assemble as follows:

1. Place Clutch Body H1 on bench with hub end (threads) up.
2. If whole ring facings are to be used: Place 1 Facing Disc H4 on hub, Center Plate H7 and 2nd Facing Disc H4.

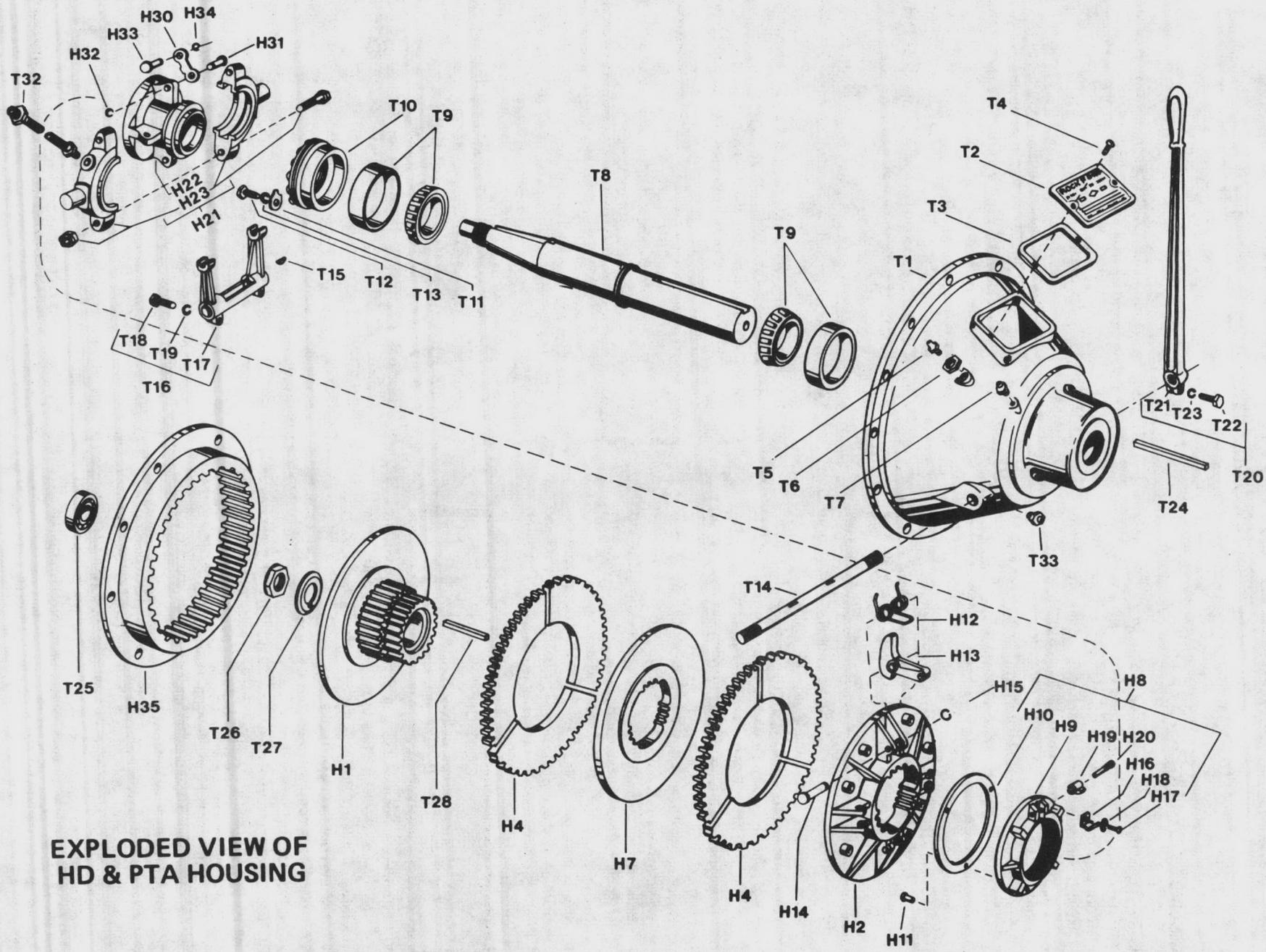
3. Lay Pressure Plate H2 friction surface down on top of the clutch body with the pressure plate drive splines in mesh with the hub drive splines.
4. Replace Levers H13, Springs H12, and Pins H14.
5. Make sure that Retainer Locks H15 are securely clamped on Pins H14.
6. Lubricate threads of the Adjusting Ring H18, place on threads of clutch body and rotate clockwise to tighten.
7. Heeding match marks assemble Release Bearing H23 to release Sleeve H22. Place the two halves together over the shoulder on the release sleeve. Fasten together with two bolts and self locking nuts. With ball type bearing press the bearing on to the sleeve and install retainer snapping.
8. Install Links H30, one link on each side of each lug on the release sleeve.
9. Install Pins H31 (with the head of the pin leading the direction of rotation) thru the links and pin holes of the release sleeve.
Secure Pins H31 with Retainer Locks H32.
10. Place release sleeve assembly on adjusting ring with links down and located in line for attachment to the levers.
11. Install Pins H33 with the head of pin leading direction of rotation.
Secure pins with Retainer Locks H34.
12. Tighten adjusting ring only tight enough to hold friction plates in place when clutch is engaged.
13. Place drive ring over clutch assembly and facing disc's teeth of the drive ring must be in mesh with teeth of facing discs.
14. Locate facing discs so as to be centrally located relative to clutch body and pressure plate.
15. Engage clutch to hold facing discs in place.

CAUTION

Do not disengage clutch until after PTA has been mounted to drive unit.

**EXPLODED VIEW OF
HD & PTA HOUSING
PART IDENTIFICATION**

IDENT. NO.	DESCRIPTION	QTY.	IDENT. NO.	DESCRIPTION	QTY.
H1	Clutch Body	1	T1	Main Housing	1
H2	Pressure Plate	1	T2	Name Plate	1
H4	Facing Disc	2	T3	Gasket-Name Plate	1
H7	Center Plate	1	T4	Screws 1/4 & 3/4	2
H8	Adjustment Ring & Lock Assy.	1	T5	Fitting 1/8	1
H12	Lever Spring	3	T6	Jam Nut - Grease Hose	1
H13	Lever	3	T7	Fitting 1/8 to Main Brng.	1
H14	Lever Pin	3	T8	Clutch Shaft	1
H15	Retainer Washer	3	T9	Bearing Assembly	2
H21	Release Sleeve Assy.	1	T10	Bearing Retainer	1
H23	Release Bearing 1/2	2	T11	Retainer Lock	1
	Bolts	2	T12	Lock Bolt	1
	Nuts Self Locking	2	T13	Lock Washer	1
H22	Release Sleeve	1	T14	Yoke Shaft	1
H30	Links	6	T15	Woodruff Key	2
H31 & 33	Pins	6	T16	Yoke Assembly	1
H32 & 34	Retainers	6	T17	Yoke	1
H35	Drive Ring	1	T18	Bolt	2
			T19	Lock Washer	2
Note:	H9-10-11-16-17-18-19 & 20 are part of H8 and not serviced separately.		T20	Handle Assembly	1
			T21	Handle	1
			T22	Bolt	1
			T23	Lock Washer	1
			T24	Drive Key Output	1
			T25	Pilot Bearing	1
			T26	Nut	1
			T27	Lock	1
			T28	Drive Key - Clutch	1
			T32	Hose Grease to Collar	1
			T33	Fitting 1/8 Drive	2



**EXPLODED VIEW OF
HD & PTA HOUSING**

SECTION D

ASSEMBLY OF POWER TAKE-OFF

(SEE EXPLODED VIEW PAGE A-3)

ASSEMBLY OF POWER TAKE-OFF

If roller bearings (T9) were removed from clutch shaft (T8), they must be installed as follows:

1. Lubricate inside diameter of roller bearing cone, then start cone straight on clutch drive shaft with wide face of the bearing cone facing shoulder on drive shaft.
2. Place Steel ring approximately 1/4" thick over end of shaft and rest on inner cone of bearing.

CAUTION

The steel ring must bear against the inner cone of bearing. Do not allow any pressure to be applied against the rollers or bearing may be damaged.

3. Place clutch drive shaft and bearing on steel ring in press.
 4. With ram of press bearing on the upper end of shaft, press bearing cone tight against shoulder on the shaft.
- Install Clutch Shaft in Power Take-Off Housing:
Install bearing cup in housing then shaft and bearings as follows:

1. Support the Power Take-Off housing (T1) on wooden blocks, forward (bell) side of housing up.
2. Lubricate outside diameter of roller bearing cup and start cup straight into bearing bore of Power Take-Off housing with back face of bearing cup down.
3. Use a hard wood block about 15" long, placed on front face of bearing cup to set cup in bore, tap block on cup alternately in several places to prevent cramping of cup.

CAUTION

Be sure cup is fully set in Power Take-Off housing bore square.

4. Lubricate roller bearings with light oil; insert output end of clutch drive shaft through bearing bore from forward side of Power Take-Off housing, until shaft bearing contacts bearing cup.
5. Lubricate second bearing cup and place over clutch drive shaft front face down.
6. Start bearing cup straight in bearing bore of Power Take-Off housing, using hard wood block and hammer, tap bearing cup to contact bearing rollers.
7. Lubricate threads of bearing retainer (T10). Place retainer over pilot bearing end of clutch shaft with notches of bearing retainer up.
8. Thread bearing retainer into Power Take-Off bearing bore up against bearing cup. Tighten bearing retainer while rotating clutch shaft, until bearing retainer is tight and bearing cups are fully set. Full set of bearing cups can be determined by increased effort required to rotate clutch drive shaft.

9. Back bearing retainer out two or three notches, shaft end play should be as charted on page 3.

CLUTCH DRIVE SHAFT END PLAY

1. Support the Power Take-Off housing with a sling or chain hoist, drive (pulley) end of shaft down.
2. Lower Power Take-Off until end of drive shaft rests on wood block on floor.
3. Take up space between bearing retainer and drive shaft by inserting four pieces of suitable shim stock equally spaced around shaft. The four pieces of shim stock must be of same thickness.
4. Mount a dial indicator to pilot bearing end of drive shaft, position indicator to contact face of Power Take-Off housing next to bearing retainer. Set dial indicator at zero.
5. Lift Power Take-Off housing and drive shaft assembly from wood block.
6. Tap pilot bearing end of shaft lightly to set shaft and outer bearing assembly against the outer roller bearing cup.

CAUTION

Do not hit the shaft hard enough to disturb the dial indicator.

7. Note reading of dial indicator. Indicator will show amount of end play between drive shaft and housing.
8. Lower Power Take-Off until end of drive shaft again rests on wood block and weight of Power Take-Off is no longer supported by hoist.
9. Tap lightly on inner side of Power Take-Off Housing, alternately around bearing retainer to insure that inner roller bearing is set against bearing cup. Dial indicator should again be at zero.
10. Readjust end play if necessary, by turning bearing retainer **CLOCKWISE** to decrease or **COUNTER CLOCKWISE** to increase drive shaft end play.
11. Repeat steps 5 thru 9 to insure shaft end play readings are correct.
12. Install bearing retainer lock and bolt.
13. Remove shim stock and dial indicator.
14. Support Power Take-Off on wood blocks in horizontal position.
15. Fill bearing cavity with Lithium Base #2 grease, until grease starts to seep out around the clutch shaft at each end of Power Take-Off housing.

NOTE

Rotate the clutch drive shaft when filling bearing cavity to be sure that bearings and housing are full of grease.

SECTION E

DISASSEMBLY OF TAPER ROLLER BEARING WITH EXTERNAL ADJUSTMENT

(NO EXPLODED VIEW - SIMILAR TO PAGE C-3)

DISASSEMBLY OF TAPER ROLLER BEARING WITH EXTERNAL ADJUSTMENT

1. With the Power Take-Off housing supported on blocks, use a standard bearing puller and remove the pilot bearing from the clutch shaft.
2. Straighten the tang on lock washer (T27). Hold clutch and shaft, remove clutch shaft nut (T26).
3. Remove the clutch from the clutch shaft (T8) as follows:
Place prybars at opposite sides over the housing and back of the clutch pressure plate. Hold pressure on both bars and rap the pilot bearing end of the shaft sharply with a babbit hammer to free clutch from shaft.
4. Remove clutch and drive key (T28) from drive shaft (T8).
5. Loosen clamp bolt (T22) and remove operating handle (T20) from cross shaft (T14).
6. Loosen the (2) bolts (T18) in yoke (T17).
7. Slide yoke left or right on the cross shaft to expose woodruff keys (T15).
8. Remove woodruff keys (T15) from cross shaft (T14).
9. Withdraw shaft (T14) from yoke (T17) and housing (T1).
10. Turn the Power Take-Off housing face down.
11. Remove the bearing retainer lock bolt (T12) and lock (T11).
12. Remove bearing retainer (T10). To remove rotate counter clockwise.
13. Remove the clutch shaft from the output end of the Power Take-Off housing. Tap pilot bearing end of the

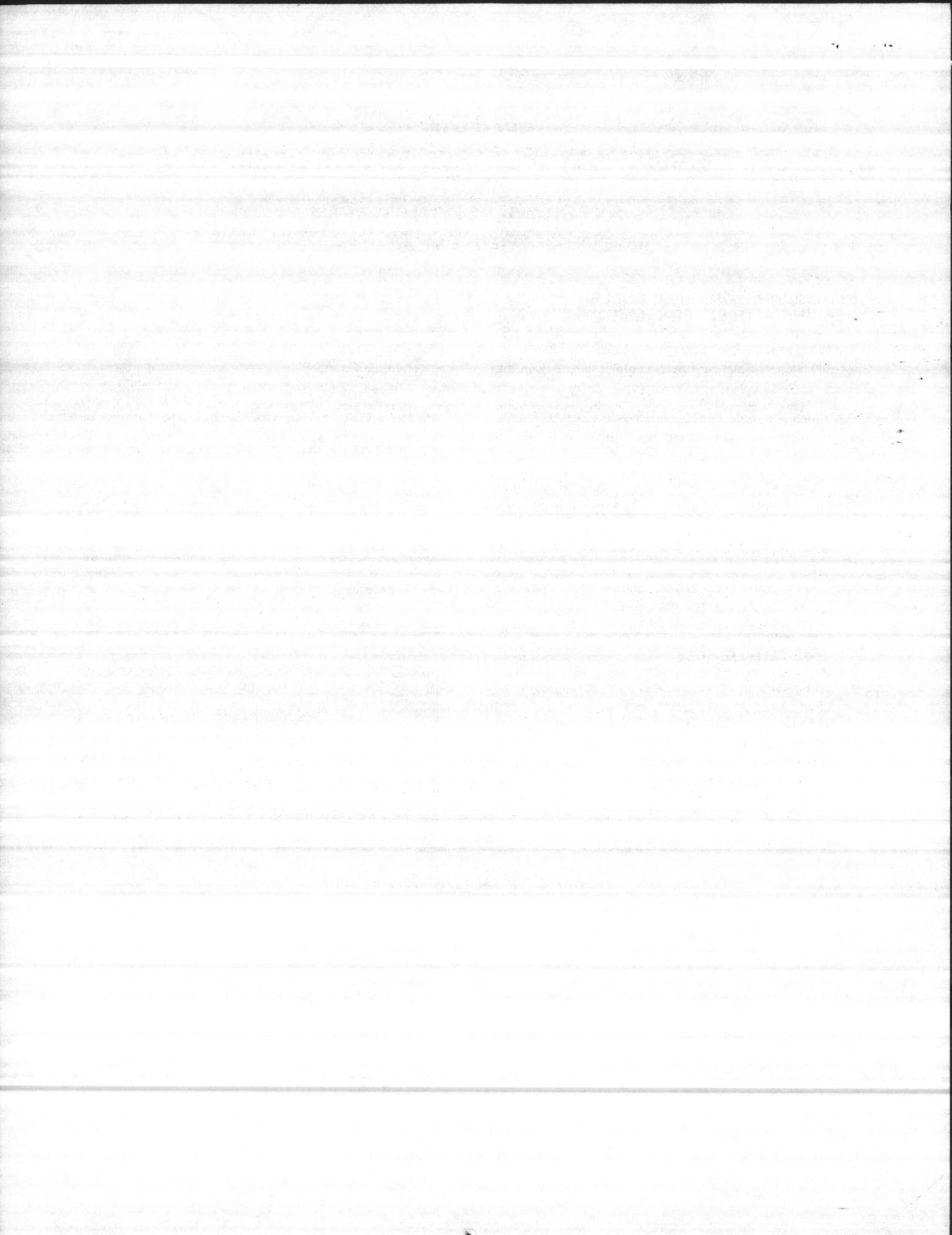
shaft lightly if bearing cup sticks in Power Take-Off housing.

14. The cup of the front roller bearing will remain in the housing after the clutch shaft has been removed.
15. Remove the front bearing cup with a standard hammer type bearing puller.
16. Wash the bearings thoroughly with clean fuel oil or solvent. Blow dry with compressed air and examine for wear, corrosion or rough spots. If it is determined that the bearings are unsatisfactory for further use they must be removed from the clutch shaft as follows:
 - A. Place a split type bearing remover between the two roller bearings.
 - B. Place clutch shaft and bearing remover on bench press and push bearing from the shaft.
 - C. Invert the shaft in the press and remove the other bearing in the same manner.

NOTE

TAPERED ROLLER BEARING
TYPE POWER TAKE OFFS
ARE
NOT RECOMMENDED
FOR INLINE
OPERATION.

(For Assembly See Section D Page D1)



SECTION F

DISASSEMBLY AND ASSEMBLY

OF

BALL BEARING TYPE

POWER-TAKE OFF

(SEE EXPLODED VIEW PAGE F-2)

DISASSEMBLY OF BALL BEARING

1. With the Power Take-Off housing supported on blocks, use a standard bearing puller and remove the pilot bearing from the clutch shaft.
2. Straighten the tang on lock washer (T27). Hold clutch and shaft, remove clutch shaft nut (T26).
3. Remove the clutch from the clutch shaft (T8) as follows:
Place prybars at opposite sides over the housing and back of the clutch pressure plate. Hold pressure on both bars and rap the pilot bearing end of the shaft sharply with a babbitt hammer to free clutch from shaft.
4. Remove clutch and drive key (T28) from drive shaft (T8).
5. Loosen clamp bolt (T22) and remove operating handle (T20) from cross shaft (T14).
6. Loosen the (2) bolts (T18) in yoke (T17).
7. Slide yoke left or right on the cross shaft to expose woodruff keys (T15).
8. Remove woodruff keys (T15) from cross shaft (T14).
9. Withdraw shaft (T14) from yoke (T17) and housing (T1).
10. Remove bearing retainer lock bolt (T12) and lock (T11).

11. Remove bearing retainer (T10) and bearing spacer (T48).
12. Remove the clutch shaft from the front of the Power Take-Off housing by tapping lightly on the output end of the shaft with a soft hammer.
13. Wash the bearing thoroughly with clean fuel oil or solvent. Blow dry with compressed air and examine for wear, corrosion or rough spots. If it is determined that the bearing is unsatisfactory for use it must be removed from the shaft as follows:
 - A. Remove snap ring (T29).
 - B. Place the clutch shaft on a press and press the bearing off the shaft.

ASSEMBLY PROCEDURE

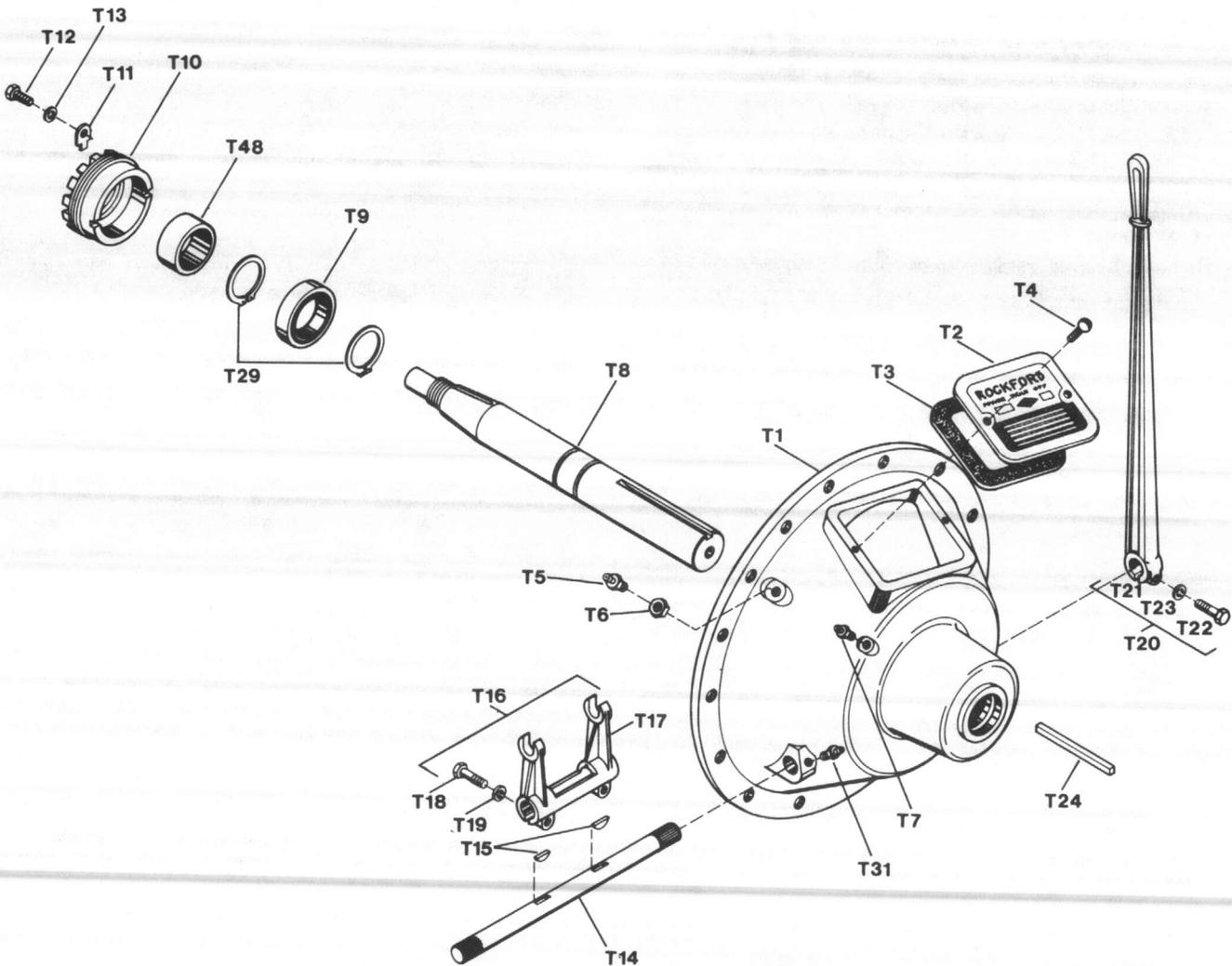
Follow disassembly procedure in reverse order to assemble the Power Take-Off, except for bearing installation.

1. Place one snap spring on the shaft, then stand shaft on end.
2. Heat bearing in oil until bearing expands enough to slide on shaft.
3. Tap bearing lightly to seat bearing against snap ring.
4. Install other snap ring against bearing.

**EXPLODED VIEW OF
BALL BEARING TYPE PTA**

PART IDENTIFICATION

ITEM NO.	DESCRIPTION	QTY.	ITEM NO.	DESCRIPTION	QTY.
T1	Main Housing	1	T14	Yoke Shaft	1
T2	Nameplate	1	T15	Woodruff Key	2
T3	Gasket-Nameplate	1	T16	Yoke Assy.	1
T4	Screws 1/4 x 3/4	2	T17	Yoke	1
T5	Grease Fitting	1	T18	Bolt	2
T6	Jam Nut - Grease Nose	1	T19	Lock washer	2
T7	Fitting 1/8 to main brng.	1	T20	Handle Assy.	1
T8	Clutch Shaft	1	T21	Handle	1
T9	Ball Bearing	1	T22	Bolt	1
T10	Bearing Retainer	1	T23	Lock washer	1
T11	Retainer Lock	1	T24	Drive Key output	1
T12	Retainer Lock Bolt	1	T29	Snapping External	2
T13	Lock washer	1	T48	Spacer	1



**EXPLODED VIEW OF
BALL BEARING TYPE PTA**

SECTION G
DISASSEMBLY AND ASSEMBLY
OF
OC CAM TYPE CLUTCH
(SEE EXPLODED VIEW PAGE G-2)

DISASSEMBLY OF OC CAM TYPE CLUTCH

1. Match mark the backplate and pressure plate prior to clutch disassembly.
2. Disengage the adjusting ring lock (A11) from the notch in backplate (A1).
3. Remove the adjusting ring (A9) from the backplate (A1) by rotating the ring counter clockwise.
4. Remove the adjusting ring wear plate (A10).
5. Remove the release sleeve (A13) and cam assemblies (A4) from the pressure plate (A2).
6. To remove backplate (A1) from pressure plate (A2), release grasshopper springs (A8) from the slot in drive lug of pressure plate. Release the spring by pushing down on the spring at the pressure plate and out.
7. Inspect all parts for wear as follows:
 - A. Inspect the pressure plate face for wear, distortion and heat checks. Inspect the cam shaft cradles. Replace cam shaft wear blocks. Check the drive lugs for excessive wear.
 - B. Inspect the backplate for cracks and wear at the drive slots. Check the adjusting ring threads for damage.
 - C. Inspect the adjusting ring wear plate if it shows flat spots or brinell indications.
 - D. Inspect facings of driven member for wear. Check drive spline.
 - E. Inspect links, link pins and pin holes for excessive wear. Check cam shaft rollers for flat spots. If cam shafts are replaced, replace in sets and always install connecting pins with head in the same direction as removed.
 - F. Inspect release sleeve and bushing for wear. Test grease hole to insure proper grease passage.

ASSEMBLY OF OC CAM TYPE CLUTCH

After all parts have been cleaned and checked and necessary parts replaced, assemble as follows:

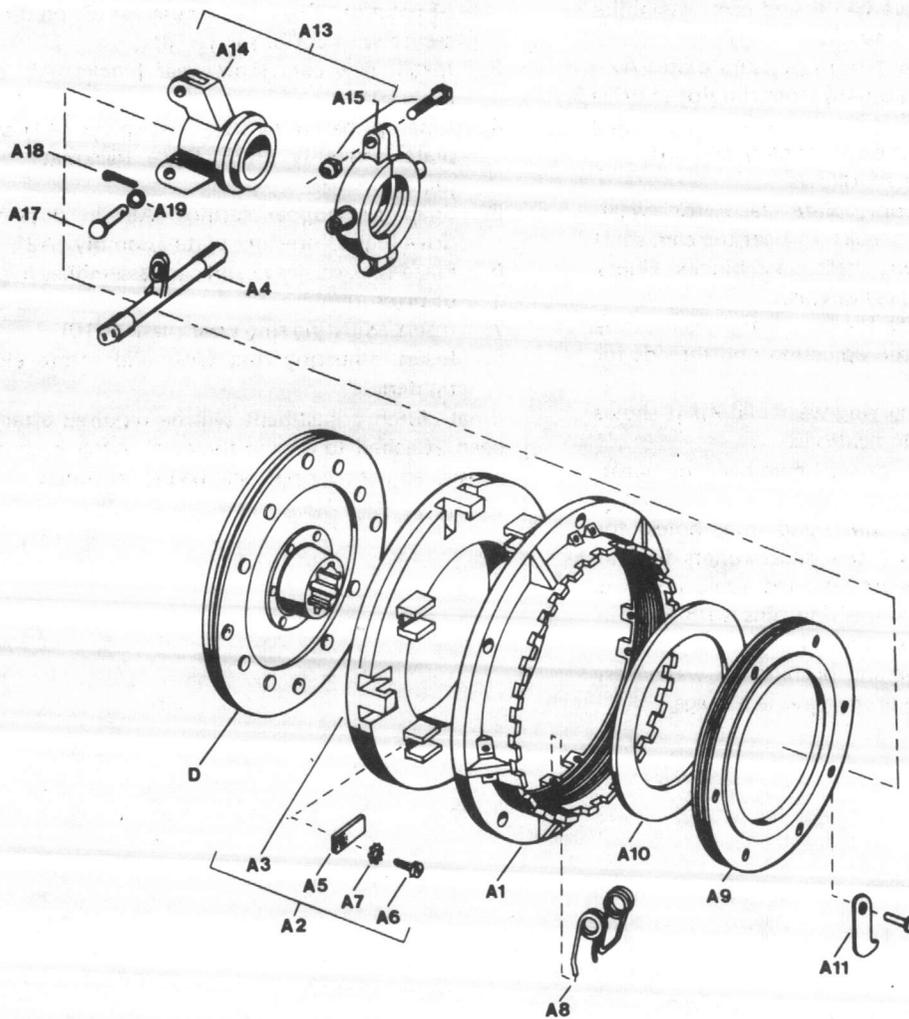
1. Assemble the release bearing (A15) to release sleeve (A14). Check to be sure the bearing does not bind when rotated on the sleeve.
2. Assemble cam shaft (A4) to release sleeve assembly (A13). Be sure the pin heads are leading the direction of rotation. Place flat washer (A19) on pin (A17) and secure with cotter pin (A18).
3. Install new cam shaft wear blocks (A5) on pressure plate (A3).
4. Line up match marks of backplate (A1) and pressure plate assembly (A2). Place backplate on pressure plate.
5. Snap grasshopper springs (A8) in slots provided in drive lugs of pressure plate assembly (A2).
6. Place release sleeve and cam assemblies in cam cradles of pressure plate.
7. Insert adjusting ring wear plate (A10).
8. Insert adjusting ring (A9) and rotate clockwise to tighten.

Final clutch adjustment will be required after clutch has been attached to engine flywheel. After each adjustment, engage adjusting ring lock (A11) in notch in back plate (A1).

EXPLODED VIEW OF
OC CAM TYPE CLUTCH

PART IDENTIFICATION

IDENT. NO.	DESCRIPTION	QTY.	IDENT. NO.	DESCRIPTION	QTY.
A1	Back Plate	1	A13	Release Sleeve Assy.	1
A2	Pressure Plate Assy.	1	A14	Release Sleeve	1
A3	Pressure Plate	1	A15	Release Bearing Assy. To include 2 Bolts & 2 Self Locking Nuts	1
A5	Cam Block	4	A17	Clevis Pin	2
A6	Cap Screws	4	A18	Cotter Pin	2
A7	Lock washer	4	A19	Washer	2
A4	Camshaft Assembly	2	D	D1-D2-D3-D4-D5 will come assembled as a unit.	
A8	Return Spring	4			
A9	Adjusting Ring	1			
A10	Adjusting Ringlock	1			
A11	Adjusting Ring Wear Plate	1			



EXPLODED VIEW OF
OC CAM TYPE CLUTCH

WARRANTY

We warrant our new products to be free from defects in material or workmanship under normal use and service. Our obligation under this warranty is limited to making good at our factory any part or parts of such products which shall be returned to us with transportation charges prepaid within six (6) months from date of delivery of said products to the consumer or the original purchaser (but not to exceed ninety (90) days of service), and which our examination shall disclose to our satisfaction to have been thus defective. All implied warranties are limited in duration to six (6) months from date of delivery to the consumer, but not exceed ninety (90) days of service. We neither assume nor authorize any person to assume for us any other liability in connection with our products.

This warranty shall not apply to any part which shall have been repaired or altered by anyone not in our employ in any way so as in our judgement to affect its stability and reliability nor which has been subject to misuse, negligence or accident.

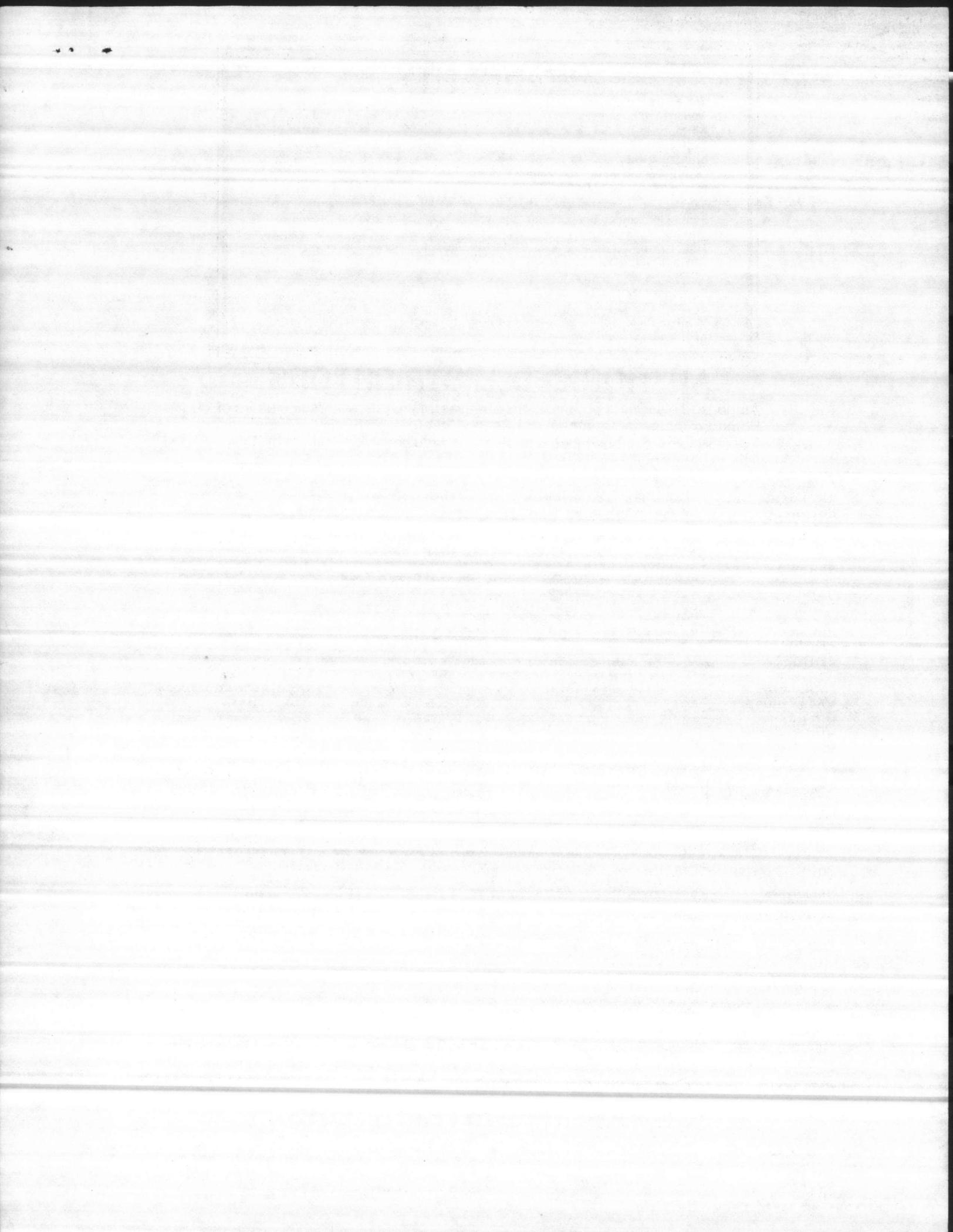
AUTHORIZED DISTRIBUTORS

Authorized distributor organizations are available to the owners and users of Rockford Industrial Clutches and Power Take-offs to furnish service, service parts and complete clutch assemblies resulting in a minimum of down-time to the owner.

ARIZONA	-AUTOMOTIVE SALES CO., 1801 N. BLACK CANYON HIGHWAY, PHOENIX, 85005
CALIFORNIA	-LANCO, INC., 12915 WEBER WAY, HAWTHORNE, 90250
COLORADO	-DRIVE TRAIN IND. INC., 3301 BRIGHTON BLVD., DENVER, 80216
FLORIDA	-CLUTCH AND GEAR INC., 2711 58TH STREET, TAMPA, 33619 -HIGHWAY EQUIP. & SUPPLY, 1016 WEST CHURCH STREET, ORLANDO, 32805 -WAYNE INC., 5663 N.W. 35TH COURT, MIAMI, 33169
GEORGIA	-BLALOCK MACHINERY & EQUIPMENT CO., 225 FORSYTH ST., S.W., ATLANTA 30303 -LEE MOTORS, 909 W. SAVANNAH AVE., VALDOSTA, 31601
ILLINOIS	-AUTO CLUTCH & PARTS SERVICE, 3125 FULLERTON AVE., CHICAGO 60647 -ROSSETTER FORD, INC., 3403 N. UNIVERSITY, PEORIA 61604 -POWERTRON, INC., 615 WEST LAKE ST., ELMHURST 60126
INDIANA	-BRAKE SUPPLY CO., INC., 4001 VOGEL ROAD, EVANSVILLE, 47711
KANSAS	-DIESEL EQUIPMENT CO., INC., 4501 WEST IRVING, WICHITA 67209
KENTUCKY	-ATLAS MACHINE & SUPPLY CO., 1326 WEST JEFFERSON ST., LOUISVILLE, 40203 -POWER UNLIMITED, 623 MYRTLE ST., LOUISVILLE 40208
LOUISIANA	-MACHINERY PARTS WAREHOUSE, 105 WESTBANK EXPRESSWAY, WESTWEGO, 70094
MASSACHUSETTS	-BOSTON CLUTCH WORKS, INC., 1486 TREMONT STREET, BOSTON, 02118
MICHIGAN	-JOINT, CLUTCH & GEAR SERVICE, INC., 1325 HOWARD ST., DETROIT, 48232
MINNESOTA	-INLAND TRUCK PARTS CO., 4135 HIAWATHA AVE., MINNEAPOLIS, 55406
MISSOURI	-K. C. DIESEL POWER CO., 9200 LIBERTY DRIVE, LIBERTY, 64068 -C. K. POWER PRODUCTS CORP., 9290 WEST FLORISSANT, ST. LOUIS, 63136 -MID-AMERICA INDUSTRIAL POWER, INC., 3637 E. KEARNEY, SPRINGFIELD, 65804
NEBRASKA	-ANDERSON INDUSTRIAL ENGINES CO., INC., 2123 SOUTH 56TH ST., OMAHA, 68106 -MIDWEST ENGINES, EAST HIGHWAY #6, P.O. BOX 1003, HASTINGS, 68901
NEW YORK	-ACME INDUSTRIAL SUPPLY CO., 349 EAST 149TH ST., BRONX, 10451 -SYRACUSE SUPPLY CO., 5921 COURT ST. RD., SYRACUSE 13201
NORTH CAROLINA	-HIGHWAY & INDUSTRIAL EQUIP. CO., INC., 5213 HILLSBORO RD., RALEIGH, 27602 -JOINT & CLUTCH SERVICE INC., P.O. BOX 282, 401 W. 24TH ST., CHARLOTTE, N.C. 28201
OHIO	-DAYTON CLUTCH & JOINT, INC., 2005 TROY ST., DAYTON, 45404 -UNIVERSAL JOINT SERVICE, INC., 1875 EAST 40TH ST., CLEVELAND, 44103
OKLAHOMA	-UNITED ENGINES, INC., 5555 WEST RENO AVE., OKLAHOMA CITY, 73107
PENNSYLVANIA	-BRAKE & CLUTCH CO. OF PHILADELPHIA, INC., 1610-14 FAIRMOUNT AVE., PHILADELPHIA, 19130 -GENUINE MOTOR PARTS OF PA., INC., 4925 BAUM BLVD AT MOREWOOD, PITTSBURGH, 15213
SOUTH DAKOTA	-MIDWEST ENGINES, 112 EAST FIRST ST., MITCHELL, 57301
TENNESSEE	-POWER UNLIMITED INC., 1401 GALWAY, KNOXVILLE, 37917
TEXAS	-GEAR, CLUTCH & JOINT, INC., 124 EAST BROADWAY, LUBBOCK, 79402 -LIGHTBOURN EQUIPMENT CO., 13649 BETA RD., DALLAS, 75240 -WHITE'S INC., 4614 NAVIGATION BLVD., HOUSTON, 77001 -HAFER'S INC., 1563 SO. 3RD WEST, SALT LAKE CITY, 84125
UTAH	-HIGHWAY & INDUSTRIAL EQUIPMENT CO., INC., 1320 INGLESIDE, NORFOLK, 23502
VIRGINIA	-PACIFIC RIM ENGINEERED PRODUCTS LTD., 15303 FIRST AVENUE SOUTH, SEATTLE, 98148
WASHINGTON	
WISCONSIN	-POWERTRON, INC., P.O. BOX 222, PEWAUKEE, 53072

CANADIAN DISTRIBUTORS

ALBERTA	-WATEROUS GM DIESEL LTD., 10025 51 AVENUE, EDMONTON, 82
BRITISH COLUMBIA	-PACIFIC RIM ENGINEERED PRODUCTS LTD., NO. 8 - 810 CAPSTAN WAY, RICHMOND
ONTARIO	-D. I. W. INDUSTRIES, 1 DAYBAR AVENUE, UNIT #4, REXDALE, ONTARIO M9W 3N8
QUEBEC	-J. A. FAGUY & SONS LTD., 750 MONTEE DE LIESSE, MONTREAL 9



LAMARCHE

Manufacturing Company

MANUFACTURER'S WARRANTY

All La Marche Mfg. Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory and is guaranteed to be free from any defect in workmanship and material that may develop within a period of one year from date of purchase.

Any part or parts of the equipment that prove defective within a one year period shall be replaced without charge when subjected to examination at our factory, providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse or misapplication. All such adjustments are made F.O.B. Des Plaines, Illinois.

Contact your local sales representative for minor parts replacement or equipment adjustments.

Should a piece of equipment require major component replacement or repair, these can be handled in one of two ways:

1. The equipment can be returned to the La Marche factory to have the inspections, parts, replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the dealer from whom the equipment was purchased will obtain authorization from the factory. If, upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer.
2. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and repairs at the equipment location, field service rates will apply. A purchase order to cover such service must be issued.

In accepting delivery of the equipment, the purchaser assumes full responsibility for proper installation, installation adjustments and service arrangements. Should minor adjustments be required, the local La Marche Sales Office should be contacted to provide this service.

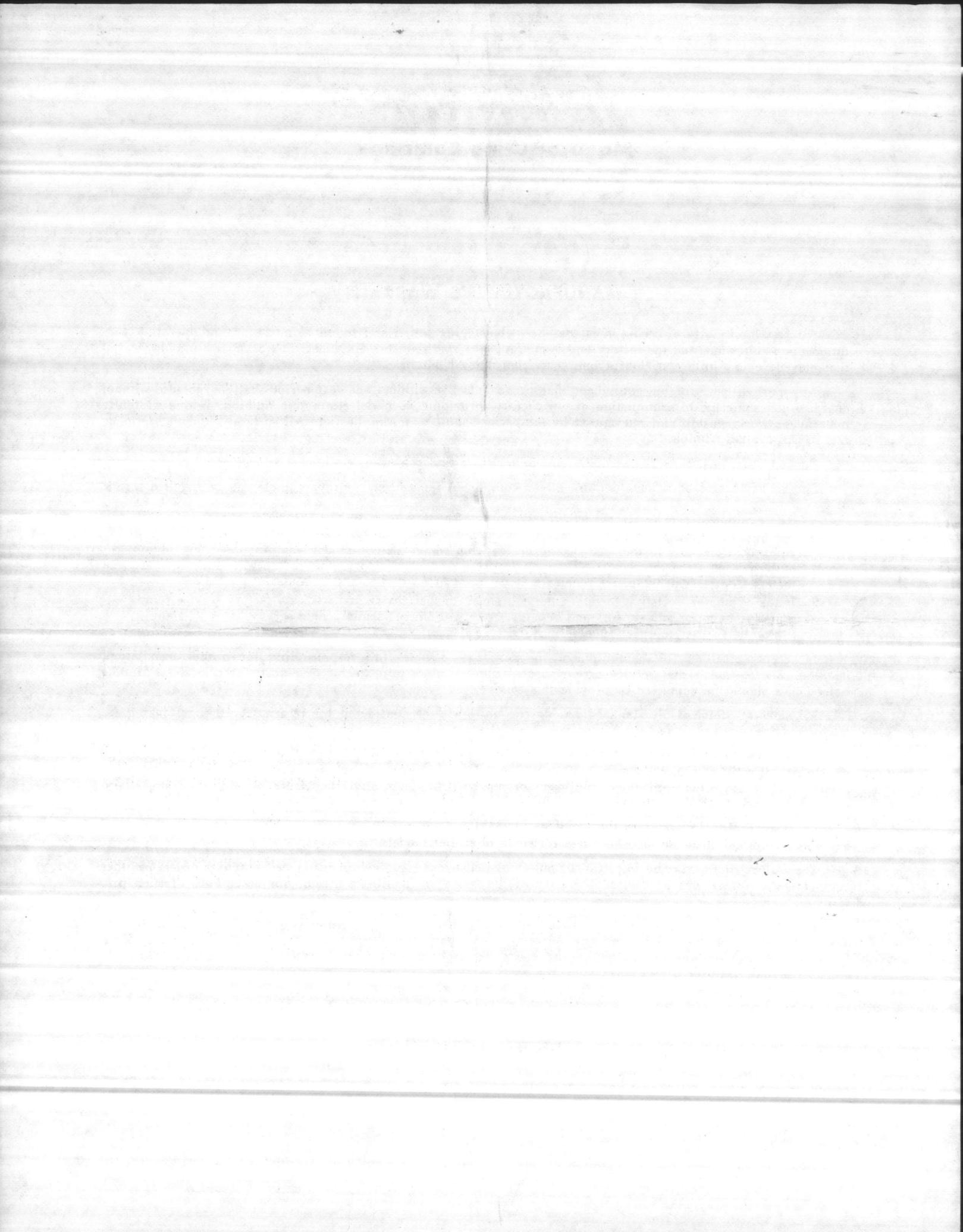
All sales are final. Only standard La Marche units will be considered for return. A 10% restocking fee is charged when return is factory authorized. Special units are not returnable.

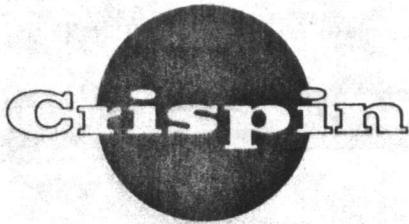
In no event shall La Marche Mfg. Co. have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause. In addition, any alterations of equipment made by anyone other than La Marche Mfg. Co. renders this warranty null and void.

La Marche Mfg. Co. reserves the privilege of making revisions in current production of equipment, and assumes no obligation to incorporate these revisions in earlier models.

The failure of La Marche Mfg. Co. to object to provisions contained in customers' purchase orders or other communications shall not be deemed a waiver of the terms or conditions hereof, nor acceptance of such provisions.

The above warranty supersedes and is in lieu of all other warranties, expressed or implied, and no person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer, nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an official of the Manufacturer.





MIDGET AIR VALVES

ORIFICE SIZING INFORMATION

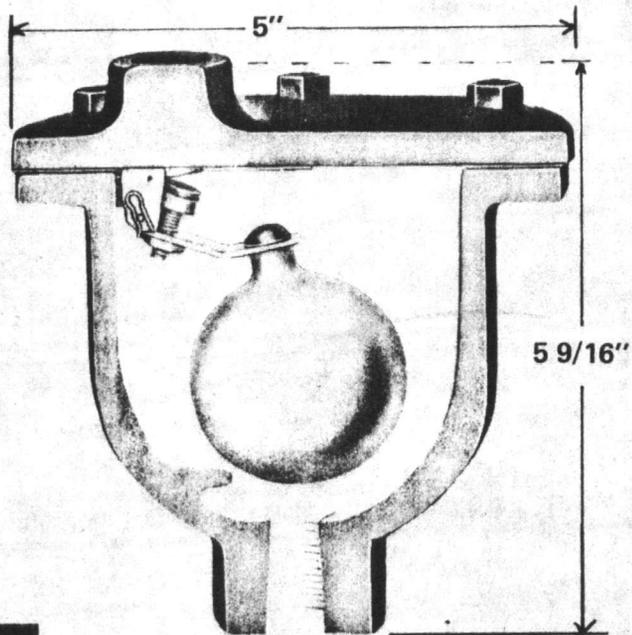
ORIFICE DIA.	RANGE OF WORKING PRESSURE
5/32"	0 TO 25 LBS.
1/8"	0 TO 40 LBS.
3/32"	0 TO 75 LBS.
1/16"	0 TO 125 LBS.
3/64"	0 TO 150 LBS.
1/32"	0 TO 225 LBS.
.028 - #70 DRILL	0 TO 300 LBS.

PARTS LIST

PART NO.	ITEM	MATERIAL	QTY. PER UNIT	
1	VALVE SEAT	STAINLESS STL.	1	
2	PLUNGER ASSEMBLY	PLUNGER	BRASS	1
2A		VALVE	HY-CAR RUBBER	1
2B		PLUNGER PIN	BRASS WIRE	1
3	PLUNGER NUT	BRASS	1	
4	VALVE LEVER	STAINLESS STL.	1	
5	SCREW (DRIVE)	STAINLESS STL.	1	
6	BALL FLOAT	STAINLESS STL.	1	
7	HINGE PIN	STAINLESS STL.	1	
7A	PIN CLIP	STAINLESS STL.	1	
8	HINGE BUTT	STAINLESS STL.	1	
9	BOLT	STEEL	6	
10	SCREW	STAINLESS STL.	1	
11	FLANGE	CAST IRON	1	
12	BODY	CAST IRON	1	
13	FLANGE GASKET	ASBESTOS	1	
*14N	NIPPLE	STEEL	1	
*14V	VACUUM CHECK VALVE	BRASS	1	

*Part No's. 14N & 14V Are Optional At Customer's Request.
Approximate Weight—6 Lbs.

NOTE: MATERIALS AND PRICES SUBJECT TO CHANGE WITHOUT NOTICE



Crispin Midget Air Valves are chosen for use in venting trapped air in hot water systems being installed at the high points of the line, thereby resulting in an increase of the B.T.U. output. The Crispin Midget Air Valve is equally well designed for venting cold water, petroleum products and many other liquids of varying specific gravities. The Midget is also ideal for automatic priming of vacuum primed pumps. A vacuum check is available if desired for attachment to the valve outlet to prevent air from re-entering the system.

MODEL INFORMATION

Size of Valve	3/8"	1/2"	3/4"	1"
Model No.	M3	M5	M8	M10
NPT-OUTLET	3/8"	3/8"	3/8"	3/8"

MULTIPLEX MANUFACTURING CO.

600 FOWLER AVE. • BERWICK, PA. 18603

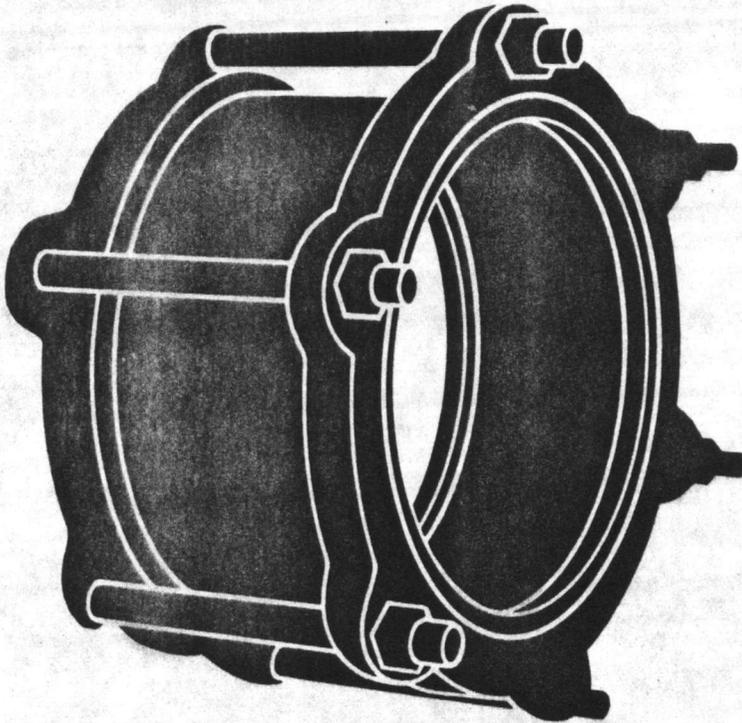
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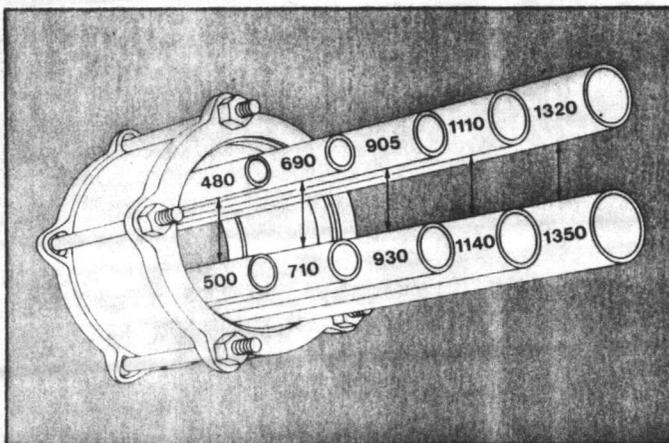
Clamp and Coupling products

cast couplings 441

3



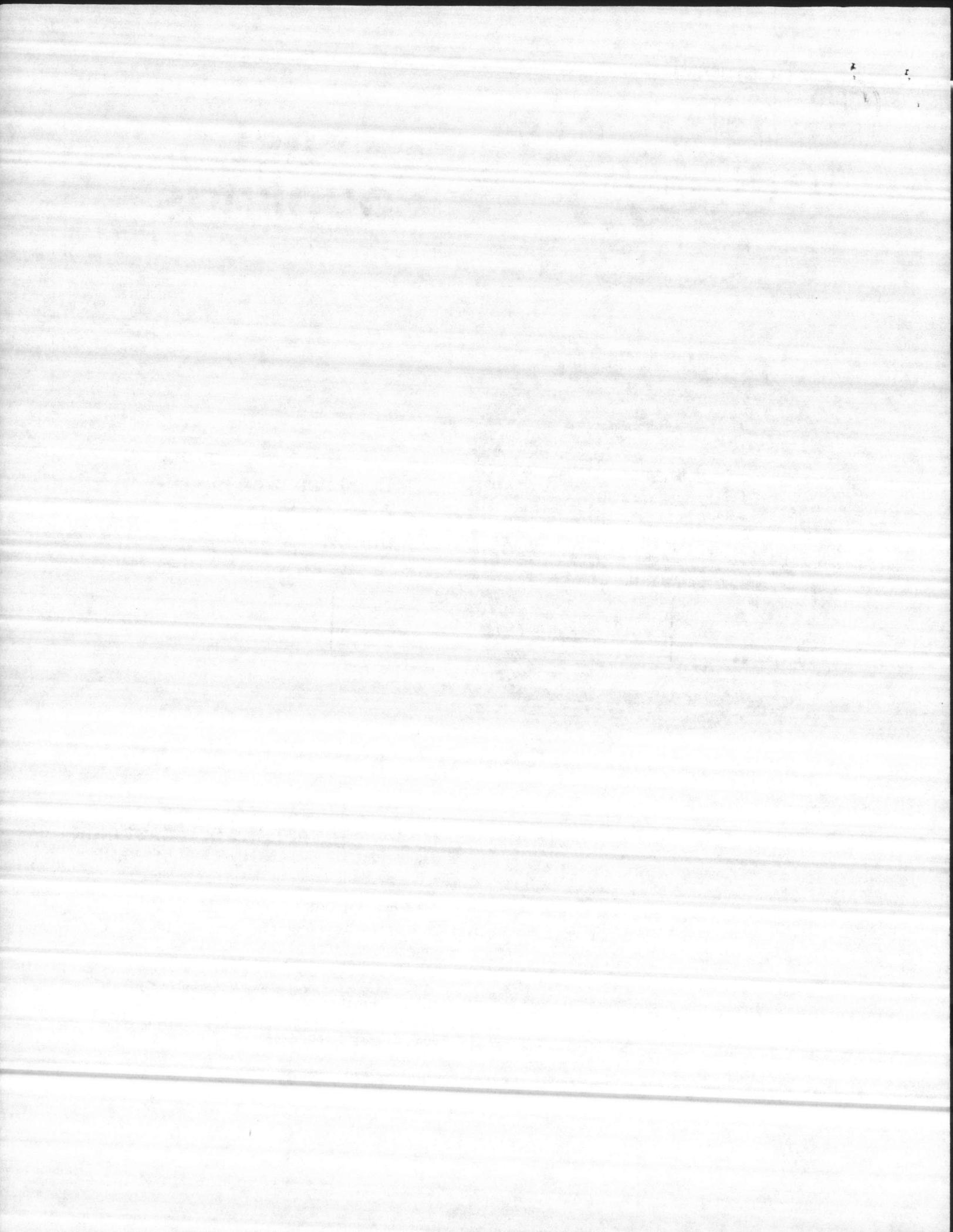
Five 441 Cast Couplings
fit all cast iron pipe
from 4" thru 12" as shown
below.



EACH TYPE 441 CAST COUPLING FITS BOTH OLD PIT CAST AND NEW CAST IRON PIPE WITHOUT CHANGING FOLLOWERS OR GASKETS

ROCKWELL 441 CAST COUPLINGS ARE

- more economical than mechanical joints.
- corrosion resistant . . . equal to cast iron pipe.
- space savers . . . bolts are close to sleeve providing for easy wrapping of polyethylene or other protective materials.
- versatile . . . fit all classes of cast iron and other types of pipe within specified range of each nominal size.





441 cast couplings for cast iron pipe

NOM. PIPE SIZE INCHES	PIPE O.D. RANGE INCHES	CODE CATALOG NUMBER	APPROX. SHIPPING WEIGHT LBS.	BOLTS			SLEEVE LENGTH INCHES
				No.	DIA. IN.	LGTH. IN.	
2	2.34- 2.63	441-0250-000	7	2	5/8	8	5
4	4.80- 5.00	441-0500-000	20	4	5/8	9	6
6	6.90- 7.10	441-0710-000	26	5	5/8	9	6
8	9.05- 9.30	441-0930-000	35	6	5/8	9	6
10	11.10-11.40	441-1140-000	42	7	5/8	9	6
12	13.20-13.50	441-1350-000	53	8	5/8	9	6

Type 441 Couplings will connect any two pipes within the O.D. Range without changing any parts. Suitable anchorage must be provided when excessive pipe movement could occur.

MATERIAL SPECIFICATIONS

SLEEVE: Gray iron ASTM A126 Class B. Ends have a smooth inside taper for uniform gasket seating.

FOLLOWERS: Malleable iron ASTM A47 Grade 32510 or ductile iron ASTM A536. Designed for high strength/weight ratio. Follower thickness determined by coupling size.

GASKETS: GRADE 30—standard—specially compounded rubber of all new materials with ingredients to produce superior storage characteristics, permanence and resistance to set after installation. Recommended for water, salt solutions, mild acids and bases. Temperature range —40°F. to 150°F.

GRADE 60—Optional—Compounded to resist—oil, natural gas, acids, alkalies, most (aliphatic) hydrocarbon fluids, water and many chemicals. Temperatures up to 212°F.

BOLTS & NUTS: High strength low alloy steel with heavy, semi-finished hexagon nuts to AWWA C111 (ANSI-A21.11) standards.

FINISH: Blue shopcoat enamel.

Material specifications are subject to change.

Refer to bulletin CC-431 for other Rockwell Cast Couplings

Municipal & Utility Division, Rockwell International / 400 North Lexington Avenue / Pittsburgh, PA 15208

sales offices—representatives in all principal cities

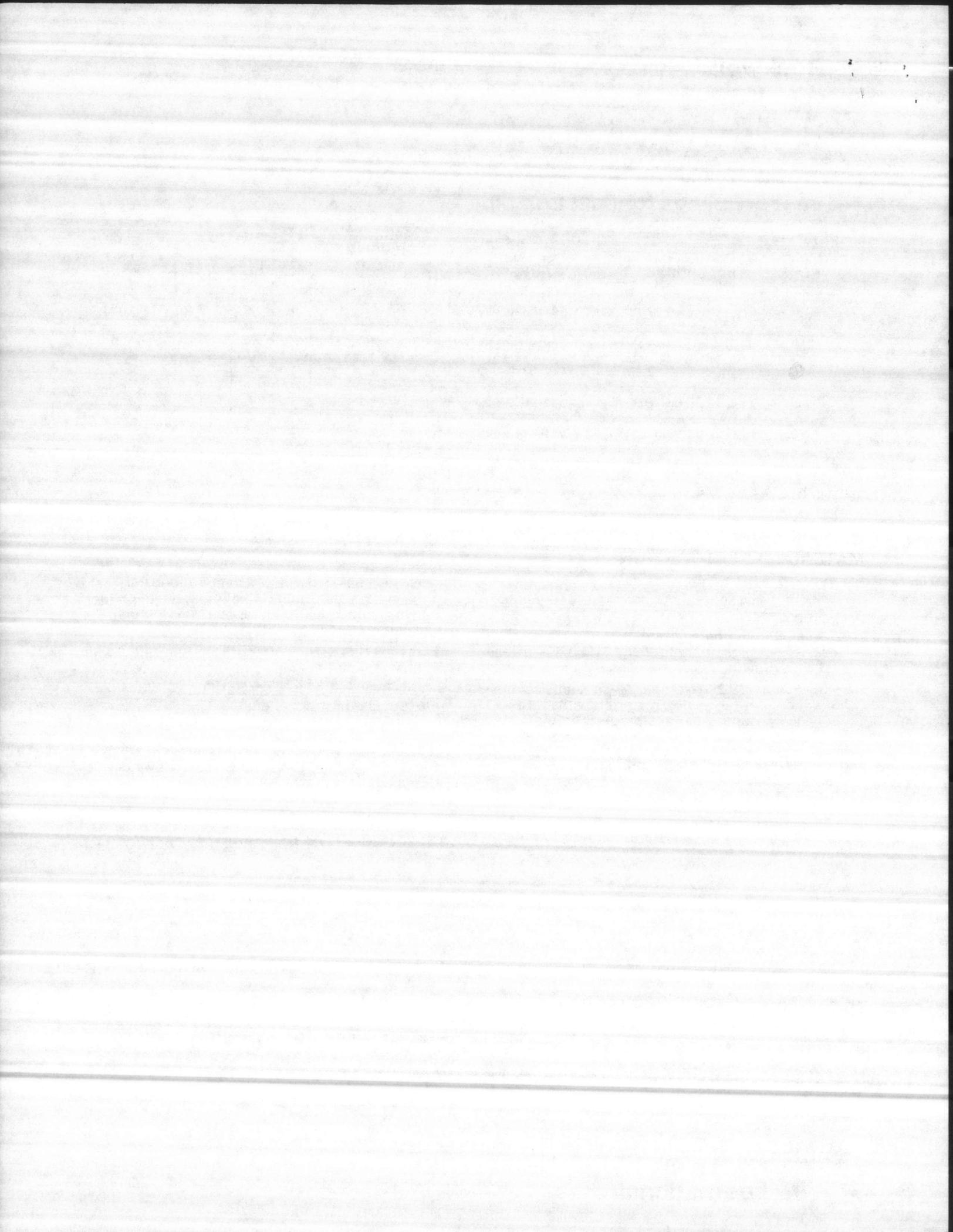
NORTHEASTERN AREA—390 North Lexington Avenue, Pittsburgh, Pennsylvania 15208 • **MID-CONTINENT AREA**—340 Shore Drive, P.O. Box 38, Hinsdale, Illinois 60521 • **SOUTHEASTERN AREA**—3500 McCall Place, Doraville, Georgia 30340 • **SOUTHWESTERN AREA**—5155 Blalock Drive, Houston, Texas 77041, P.O. Box 40126 (Zip Code) 77040 • **WESTERN AREA**—6363 Knott Avenue, Buena Park, California 90620

CANADIAN LISTINGS—Rockwell International of Canada Ltd, Montreal-Calgary-Vancouver, 41 Massey Road, Guelph, Ontario N1H 6L3

INTERNATIONAL LISTINGS—Municipal & Utility Division, Rockwell International, 400 North Lexington Avenue, Pittsburgh, Pennsylvania 15208 distributors throughout the world



Rockwell International



CAST IRON OR DUCTILE IRON FABRICATED PIPE AND CASTINGS

UNION FOUNDRY'S CAST IRON OR DUCTILE IRON PIPE AND FITTINGS is the ONE ALL-PURPOSE PRODUCT used in Water Purification and Waste Water Plants, Pumping Stations, Sewage Disposal and Industrial Processing Plants.

WATER AND WASTE WATER TREATMENT PLANTS

A variety of cast iron fittings and specials is available to meet the intricate piping layouts in water and waste water treatment plants and pumping stations. It is this factor, together with the durability and strength of iron pipe and fittings, that has made them the standard plant piping material for more than 100 years. Flanged and grooved end pipe and flanged fittings are particularly suited to this type of construction due to ease of installation in close quarters and the ability to withstand thrust without external restraint. These are important requirements for plant piping.

Because of the increased emphasis on more complete treatment of sewage and industrial wastes, more waste water treatment plants today are of the activated sludge type. Because much of the piping in these plants is underground or in concrete and not easily accessible for repairs, the permanently tight joints, durability, and strength of iron pipe and fittings are important qualities, as is its sustained carrying capacity, which keeps sludge pumping cost to a minimum.

Probably the most important property of iron pipe in waste water treatment plant service, however, is its superior corrosion resistance. Because of the often corrosive nature of the sludges, gases, and supernatant liquors encountered in waste treatment plants of all types, the use of iron pipe and fittings insures a material which will give long and satisfactory service.

INDUSTRIAL APPLICATIONS

The strength, durability and reliability of iron pipe are highly desirable qualities also in industrial plants where the consequences of pipe failure such as lost production or possible damage to expensive equipment, for example, can be extremely costly.

Aside from ordinary water supply service for both domestic and process use, there are a number of other applications for iron pipe in industri-

al plants. Chief among these is internal fire protection systems. The proven reliability of iron pipe is most important in high-value plants which often contain extremely flammable materials.

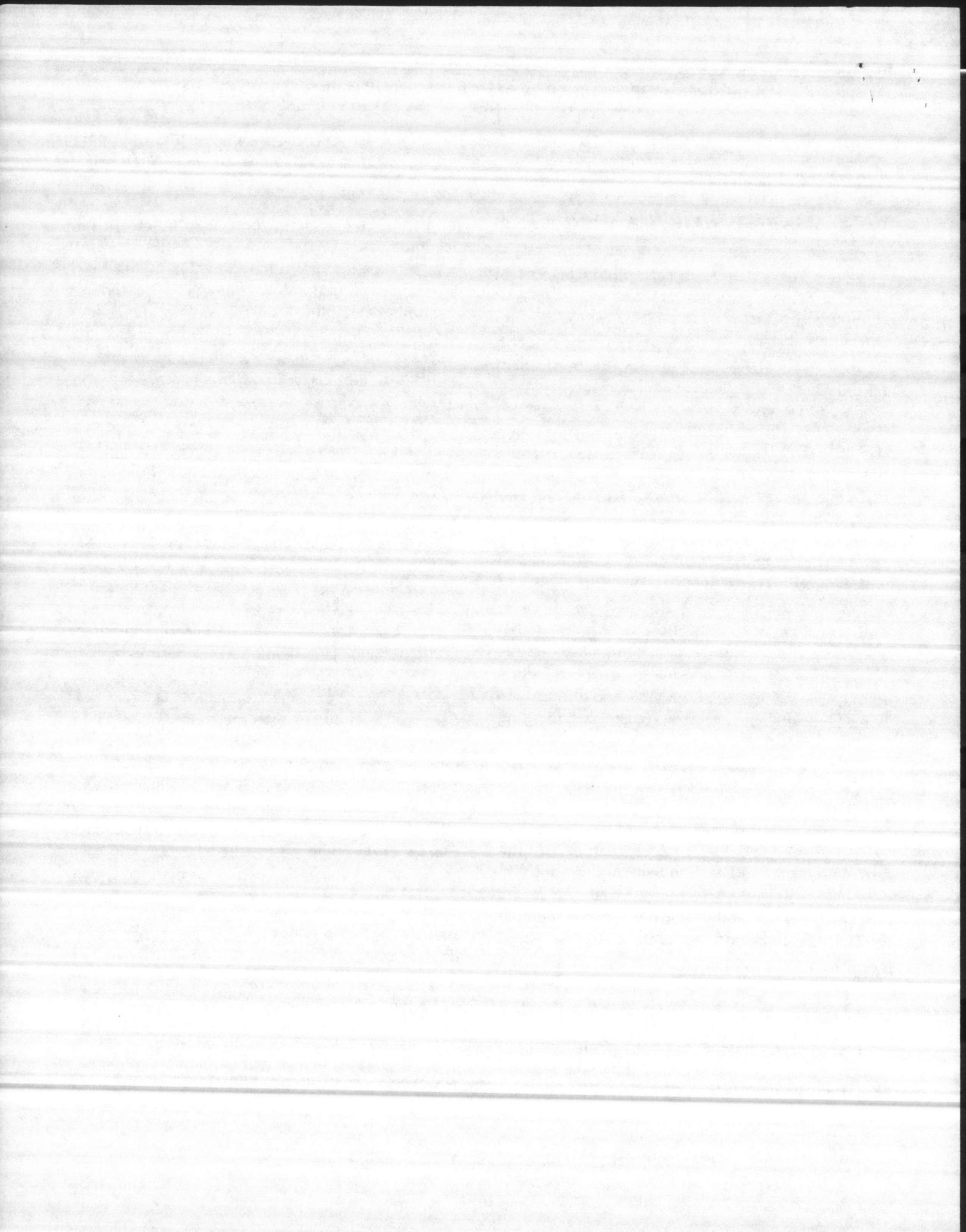
Some of the other uses are cooling water lines, especially when salt or brackish water is used and corrosion resistance is essential; condensate return lines; lines carrying various process solutions requiring a corrosion-resistant conduit, and various types of waste and drain lines.

UNION FOUNDRY in addition to having the PRODUCT has the well-equipped FABRICATION PLANT with EXPERIENCED PERSONNEL to operate it, the ENGINEERING DEPARTMENT with COMPETENT PIPING ENGINEERS, the SALE ENGINEERS and SALES STAFF with the KNOWLEDGE and DESIRE TO SERVE your needs for FABRICATED PIPE AND CASTINGS.

Your inquiries are solicited and should be addressed to our Quotation Department. Our engineers can make job takeoff from plans and specifications furnished or from Dodge Scan Service. Upon award of contract to us our piping engineers can make detailed layouts and drawings at prices agreed upon and submit to you for approval. Our sales engineers will meet with you and discuss job priorities and production schedule and give assistance until job is completed. Orders will be handled by our sales correspondents who will keep informed, and keep you informed, as job progresses.

UNION FOUNDRY CAST IRON OR DUCTILE IRON PRODUCTS FOR FABRICATED PIPING

- 3" through 24" Pipe, gray iron, with threaded, flanged or grooved ends.
- 3" through 24" Pipe, ductile iron, with threaded, flanged or grooved ends.
- 2" through 24" Flanged Fittings.
- Coatings and Linings—Bituminous coatings and linings are standard. For special conditions uncoated, cement-lined and other types of coatings and linings are available.
- All manufactured to meet Engineer's Specifications.



SHORT BODY FLANGED FITTINGS—Dimensions and Weights

SPECIFICATIONS

AMERICAN NATIONAL STANDARDS INSTITUTE SPECIFICATION ANSI A 21.10 (AWWA C110)
 AMERICAN NATIONAL STANDARD FOR CAST IRON FITTINGS FOR WATER & OTHER FLUIDS
 AMERICAN NATIONAL STANDARDS INSTITUTE SPECIFICATION ANSI B 16.1
 CAST IRON PIPE FLANGES AND FLANGED FITTINGS, CLASS 125

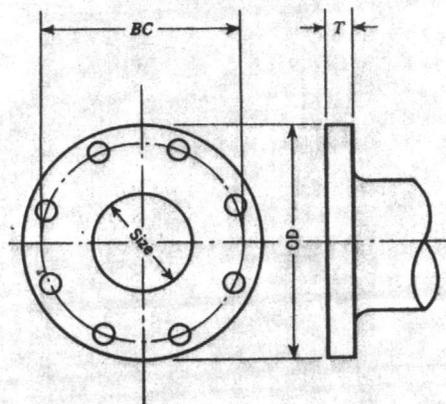
UNION FOUNDRY manufactures 125-pound flanged fittings conforming to above specifications and also additional flanged items to our own manufacturing standard. Specification that applies to item is shown on each page.

Cement-mortar linings shall be in accordance with ANSI A21.4 (AWWA C104) of latest revision. If desired, cement linings shall be specified in the invitation for bid and on the purchase order.

Special coatings and linings for special conditions may be available. Such special coatings and linings shall be specified in the invitation for bid and on the purchase order.

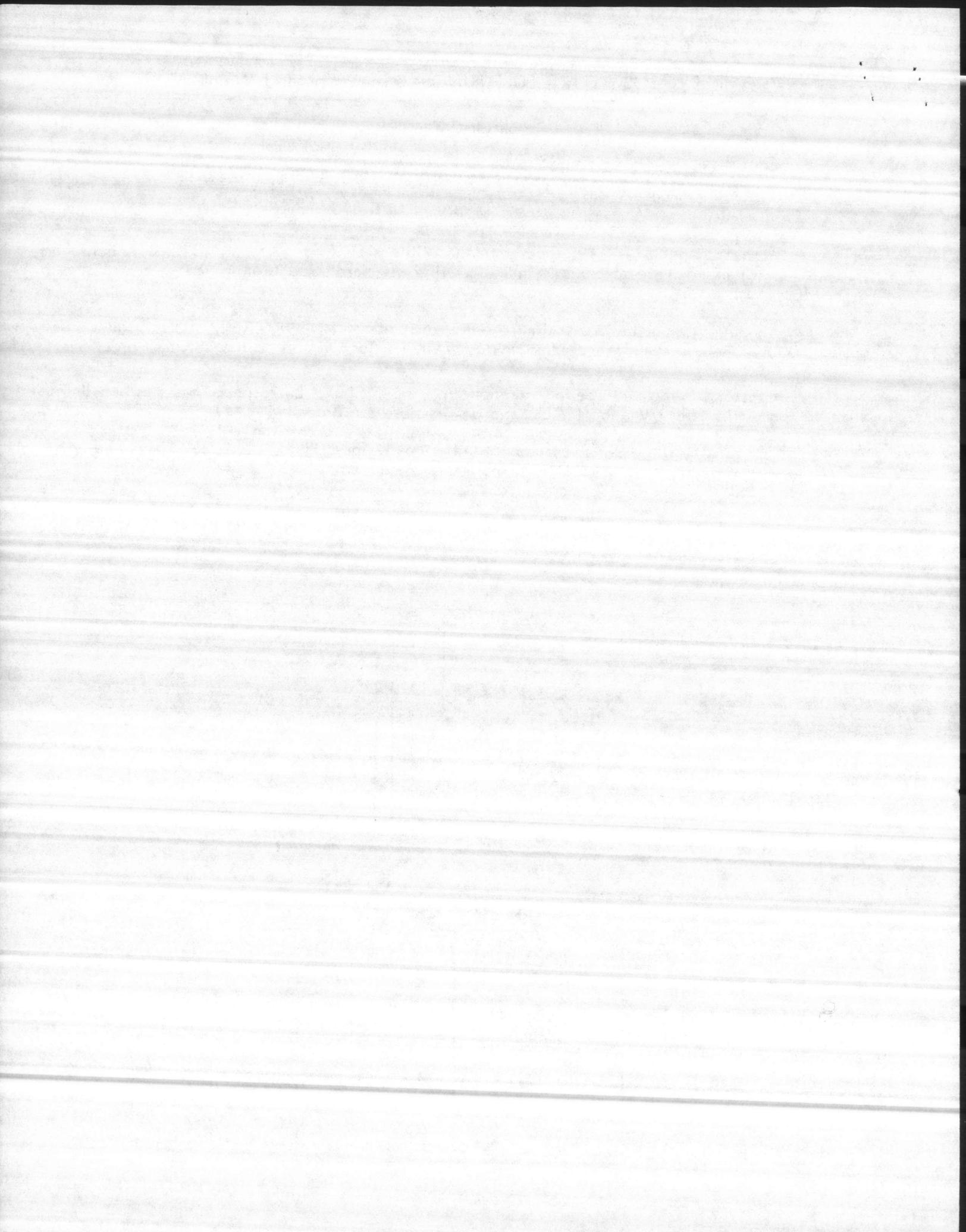
All of our flanged fittings are drilled to 125-pound template for drilling shown below whether ANSI A21.10 (AWWA C110), ANSI B16.1 or manufacturer's standard.

④



ANSI B16.1 — CLASS 125

Size	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Number of Bolts	Size of Bolts	Diameter of Bolt Holes	Size of Full Face Gaskets	Size of Ring Gaskets
2	6.00	.62	4.75	4	5/8 x 2 1/4	3/4	2x 6	2x 4 1/8
3	7.50	.75	6.00	4	5/8 x 2 1/2	3/4	3x 7 1/2	3x 5 3/8
4	9.00	.94	7.50	8	5/8 x 3	3/4	4x 9	4x 6 7/8
6	11.00	1.00	9.50	8	3/4 x 3 1/4	7/8	6x 11	6x 8 3/4
8	13.50	1.12	11.75	8	3/4 x 3 1/2	7/8	8x 13 1/2	8x 11
10	16.00	1.19	14.25	12	7/8 x 3 3/4	1	10x 16	10x 13 3/8
12	19.00	1.25	17.00	12	7/8 x 3 3/4	1	12x 19	12x 16 1/8
14	21.00	1.38	18.75	12	1 x 4 1/4	1 1/8	14x 21	14x 17 3/4
16	23.50	1.44	21.25	16	1 x 4 1/2	1 1/8	16x 23 1/2	16x 20 1/4
18	25.00	1.56	22.75	16	1 1/8 x 4 3/4	1 1/4	18x 25	18x 21 5/8
20	27.50	1.69	25.00	20	1 1/8 x 5	1 1/4	20x 27 1/2	20x 23 7/8
24	32.00	1.88	29.50	20	1 1/4 x 5 1/2	1 3/8	24x 32	24x 28 1/4



SHORT BODY FLANGED FITTINGS—Dimensions and Weights

ANSI SPECIFICATION A 21.10 (AWWA C 110)

FURNISHED FACED AND DRILLED TO 125 POUND TEMPLATE (SEE PAGE 20)

UNLESS OTHERWISE SPECIFIED

BOLT HOLES ARE NOT SPOT-FACED UNLESS ORDERED

FURNISHED WITH BITUMINOUS COATING UNLESS OTHERWISE SPECIFIED

BENDS

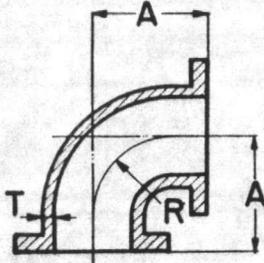
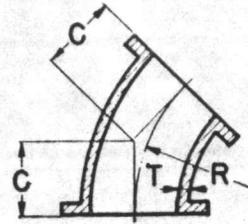


Fig. 401. 90° Bend



* Fig. 402. 45° Bend

Size	Pressure Rating psi	T	90° Bend			45° Bend		
			R	A	Weight	R	C	Weight
2	250	.35	3.0	4.5	14	2.44	2.5	12
3	250	.48	4.0	5.5	25	3.62	3.0	20
4	250	.52	4.5	6.5	45	4.81	4.0	40
6	250	.55	6.0	8.0	65	7.25	5.0	55
8	250	.60	7.0	9.0	105	8.44	5.5	90
10	250	.68	9.0	11.0	165	10.88	6.5	130
12	250	.75	10.0	12.0	235	13.25	7.5	195
14	250	.82	11.5	14.0	330	12.06	7.5	245
16	250	.89	12.5	15.0	430	13.25	8.0	315
18	250	.96	14.0	16.5	530	14.50	8.5	375
20	250	1.03	15.5	18.0	685	16.88	9.5	485
24	250	1.16	18.5	22.0	1085	18.12	11.0	730

For base bends see page 5-8.

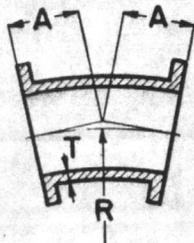


Fig 403. 22½° Bend

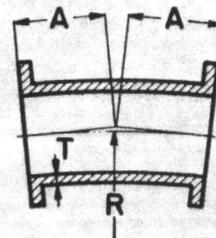
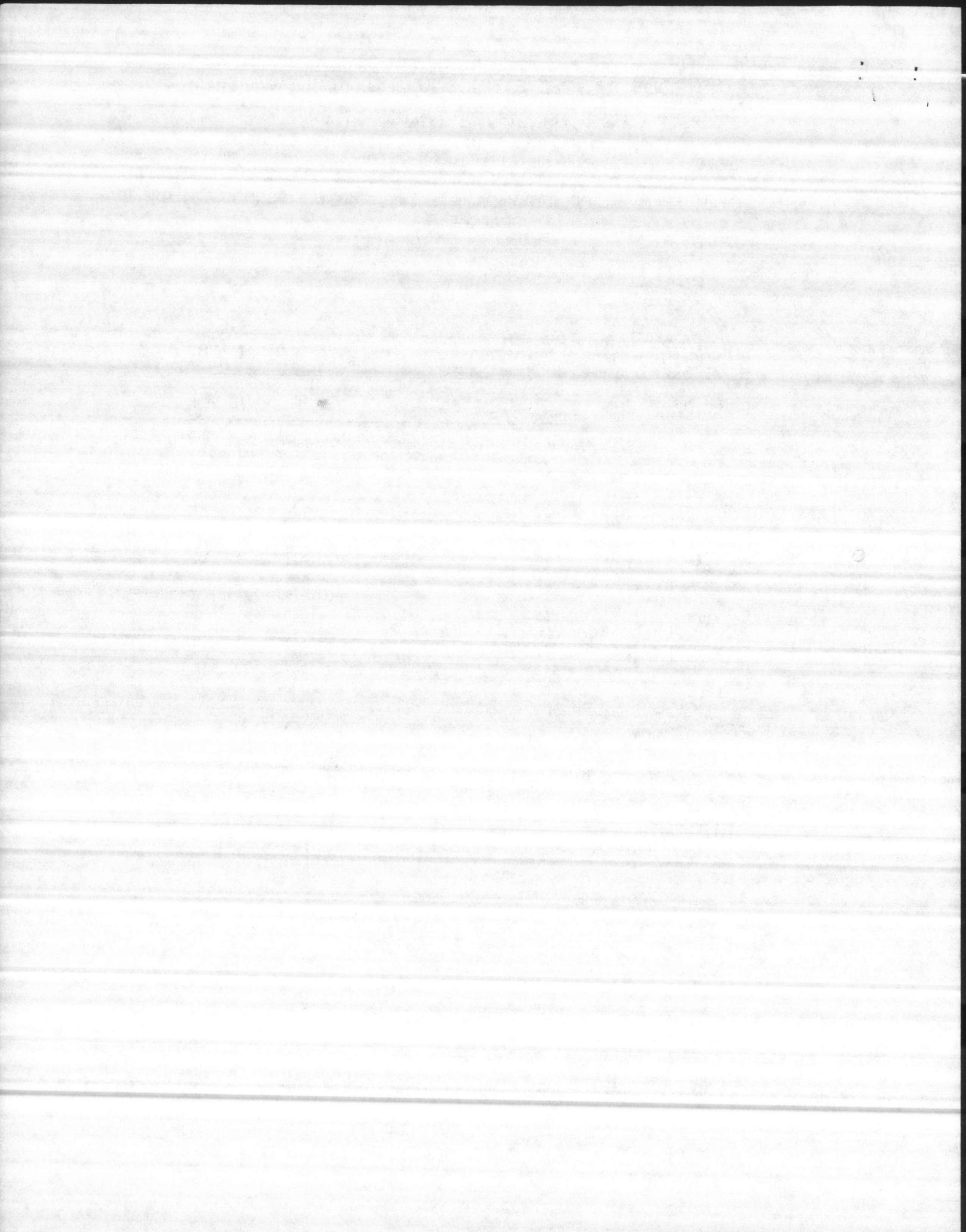


Fig. 404. 11¼° Bend

Size	Pressure Rating psi	T	22½° Bend			11¼° Bend		
			R	A	Weight	R	A	Weight
3	250	.48	7.56	3.0	20	15.25	3.0	20
4	250	.52	10.06	4.0	40	20.31	4.0	40
6	250	.55	15.06	5.0	55	30.50	5.0	55
8	250	.60	17.62	5.5	90	35.50	5.5	90
10	250	.68	22.62	6.5	135	45.69	6.5	135
12	250	.75	27.62	7.5	205	55.81	7.5	205
14	250	.82	25.12	7.5	225	50.75	7.5	225
16	250	.89	27.62	8.0	285	55.81	8.0	285
18	250	.96	30.19	8.5	335	60.94	8.5	335
20	250	1.03	35.19	9.5	435	71.06	9.5	435
24	250	1.16	37.69	11.0	640	76.12	11.0	645

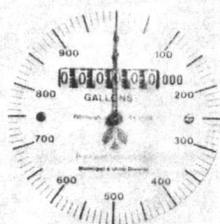


Rockwell

PROPELLER METERS

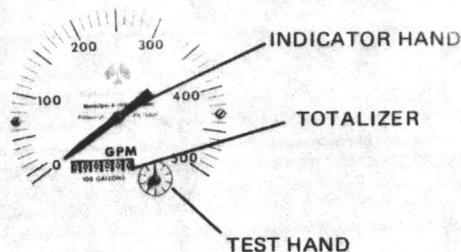
MODEL 101 and 102
 150 psi CAST IRON FLANGED TUBE
 MAGNETIC DRIVE — SEALED GEAR HOUSING
 SIZES 3" thru 12"

MODEL 101

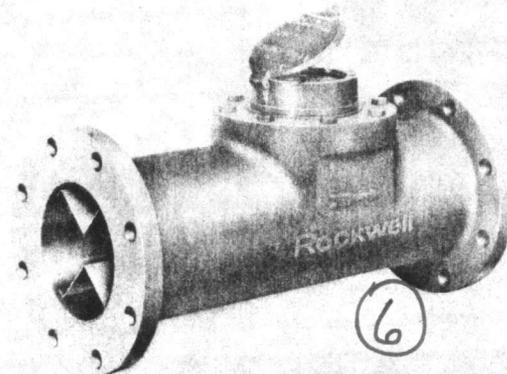


STANDARD REGISTER

MODEL 102



INDICATOR-TOTALIZER



8" MODEL 101 ILLUSTRATED

DESCRIPTION

MODEL 101 AND 102 PROPELLER METERS are intended for the measurement of cold water, either potable or non-potable, within specified flow limits. The meter tubes are cast iron and contain stainless steel liners and straightening vanes. (The 3" size does not have a full length liner.) The flanged ends conform to ANSI Class 125 drilling dimensions.

MAGNETIC DRIVE: The propeller is magnetically coupled, thus eliminating mechanical packings and stuffing boxes. A sleeve type, ceramic magnet in the propeller drives the follower magnet which is located inside the propeller spindle (separator).

RIGHT ANGLE GEARING: The brass bevel gears are sealed in an oil-filled gear housing. The gears are attached to shafts connecting the follower magnet to the register. The gear housing is factory lubricated for the life of the meter.

CERAMIC BEARINGS: The propeller contains radial ceramic bearings. The sleeve type bearings mate with the ceramic coated propeller spindle (separator). The extremely durable ceramic bearings and spindle combination permit the meter to measure water containing entrained sand without undue wear.

STANDARD REGISTER: It features a 4" diameter, 100 division dial with center sweep hand. The register can be positioned in any of four different directions for easy reading when the meters are mounted in vertical or overhead installations.

INDICATOR-TOTALIZER: It provides a 270° arc for reading instantaneous flow rate. A six digit totalizer and test circle are also included.

INSTALLATION: The meter is installed in a pipeline similar to placing a short length of flanged end pipe in the line. The meter may be installed in any position: Horizontal, vertical or inclined. The meter must have a full flow of water in the pipeline for proper registration. Valves, fittings or other obstructions which might create a flow disturbance should be at least five pipe diameters upstream and one pipe diameter downstream from the meter location.

O-RINGS: The meter head to tube body connection on 6" meters and larger are sealed with O-rings. (3" and 4" meters use a flat gasket.) All other areas where water seals are required have O-rings.

INSTRUMENTATION: For applications requiring instrumentation, various transmitters are available which mount between the meter head and the register. See the transmitter product data sheets for signal output capabilities and Rockwell ACT-PAK (instruments) literature for additional details.

MAINTENANCE: The meter head can be removed and repaired without disturbing the tube body in the pipeline. Blank covers are also available for line flushing or to keep the customer's line in service while the meter head is repaired and recalibrated. Factory meter head exchange programs are also available for testing and/or maintenance purposes.

SPECIFICATIONS

SERVICE ACCURACY

where fluid flow is in one direction only.
 100 ± 2% of actual flow within specified normal and intermittent flow ranges. 95% minimum at low flow rate.

PRESSURE RATING

150 psi maximum working pressure.

TEMPERATURE

100° F maximum

MAXIMUM FLOWS

maximum normal flow rates are for continuous service.

INTERMITTENT FLOWS

as shown are for use 10% to 15% of total time meter is operating.

STANDARD REGISTER

six digit straight reading type with full 4" diameter, 100 division dial and center sweep test hand. Registration available in gallons, cubic feet, acre feet, liters, cubic meters, miners inch hours, barrels and other standard units.

INDICATOR-TOTALIZER

combination of a 4" dial for instantaneous rate of flow indication and a six digit totalizer. Indicator dial can be furnished to read in gallons per minute, cubic feet per second, million gallons per day and other standard units.

FLANGE ENDS

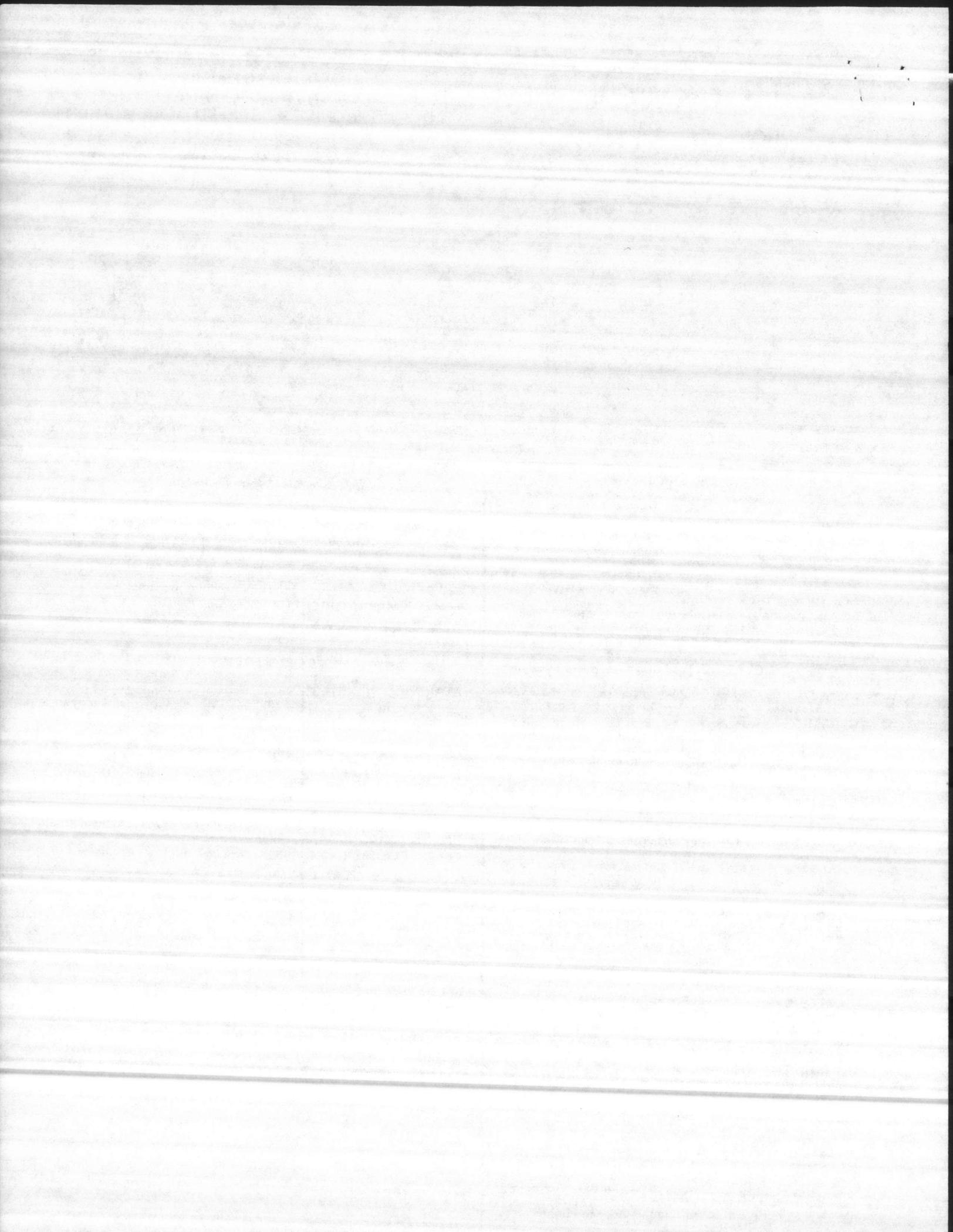
ANSI Class 125 drilling

MATERIAL

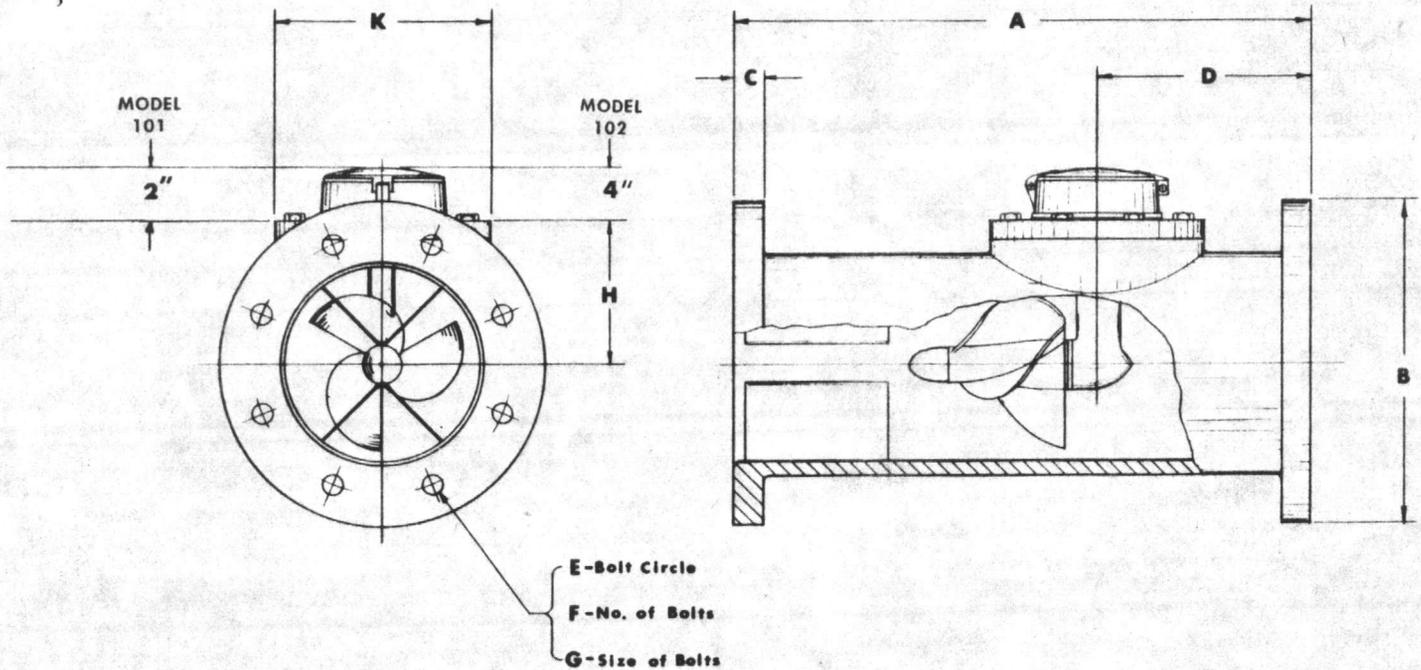
tube body — cast iron with stainless steel lining and straightening vanes
 meter head — cast iron
 propeller and nut — polypropylene
 propeller spindle (separator) — stainless steel, ceramic coated
 rotor bearings — ceramic
 magnets — permanent, ceramic sleeve type
 gear housing — cast bronze
 shafts and bolts — stainless steel

OPTIONAL EQUIPMENT

blank covers, register extensions, transmitters for Rockwell ACT-PAK and other instruments are available.



MODEL 101 and 102



METER SIZE	LOW FLOW†	NORMAL RANGE†	INTERMITTENT MAXIMUM FLOW†	DIMENSIONS									SHIPPING WEIGHT POUNDS
				A	B	C	D	E	F	G	H	K	
3*	80	100- 250	350	16	7-1/2	3/4	6-1/2	6	4	5/8	3-3/8	5	70
4	85	125- 500	700	18	9	1	7-1/2	7-1/2	8	5/8	3-7/8	5	90
6	160	220-1200	1500	22	11	1	9	9-1/2	8	3/4	5	9	150
8	190	250-1500	2000	24	13-1/2	1-1/8	9	11-3/4	8	3/4	6	9	220
10	260	330-2000	3000	26	16	1-3/16	10	14-1/4	12	7/8	7-3/8	11	310
12	275	400-2500	3500	28	19	1-1/4	10	17	12	7/8	8-3/8	11	420

*3" meter for special applications only.

Low Flow: 95% minimum accuracy.

Normal Range and Intermittent Maximum Flow: 100 ± 2% accuracy.

† Flow Rates: U.S. Gallons/Minute

Municipal & Utility Division, Rockwell International/400 North Lexington Avenue/Pittsburgh, PA 15208

sales offices – representatives in all principal cities

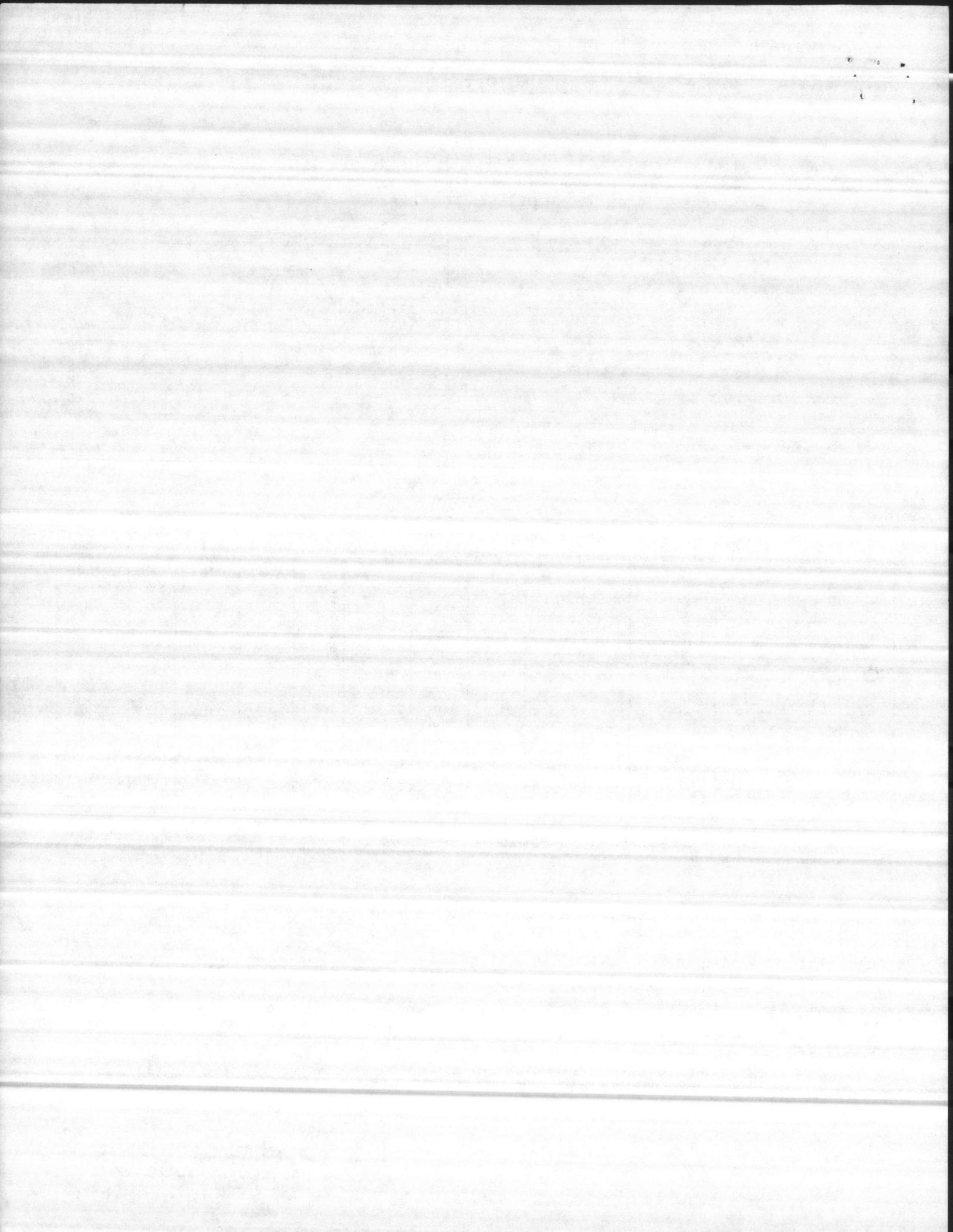
NORTHEASTERN AREA – 390 North Lexington Avenue, Pittsburgh, Pennsylvania 15208 • **MID-CONTINENT AREA** – 340 Shore Drive, P.O. Box 38, Hinsdale, Illinois 65021 • **SOUTHEASTERN AREA** – 3500 McCall Place, Doraville, Georgia 30340 • **SOUTHWESTERN AREA** – 5155 Blalock Drive, Houston, Texas 77041, P.O. Box 40126 (Zip Code) 77040 • **WESTERN AREA** – 6363 Knott Avenue, Buena Park, California 90620

CANADIAN LISTINGS – Rockwell International of Canada Ltd., Montreal-Calgary-Vancouver, 41 Massey Road, Guelph, Ontario N1H 6L3

INTERNATIONAL LISTINGS – Municipal & Utility Division, Rockwell International, 400 North Lexington Avenue, Pittsburgh, Pennsylvania 15208
Rockwell International, S.A., 430 Bath Road, Slough SL1 6BB, Berkshire, England

Distributors throughout the world



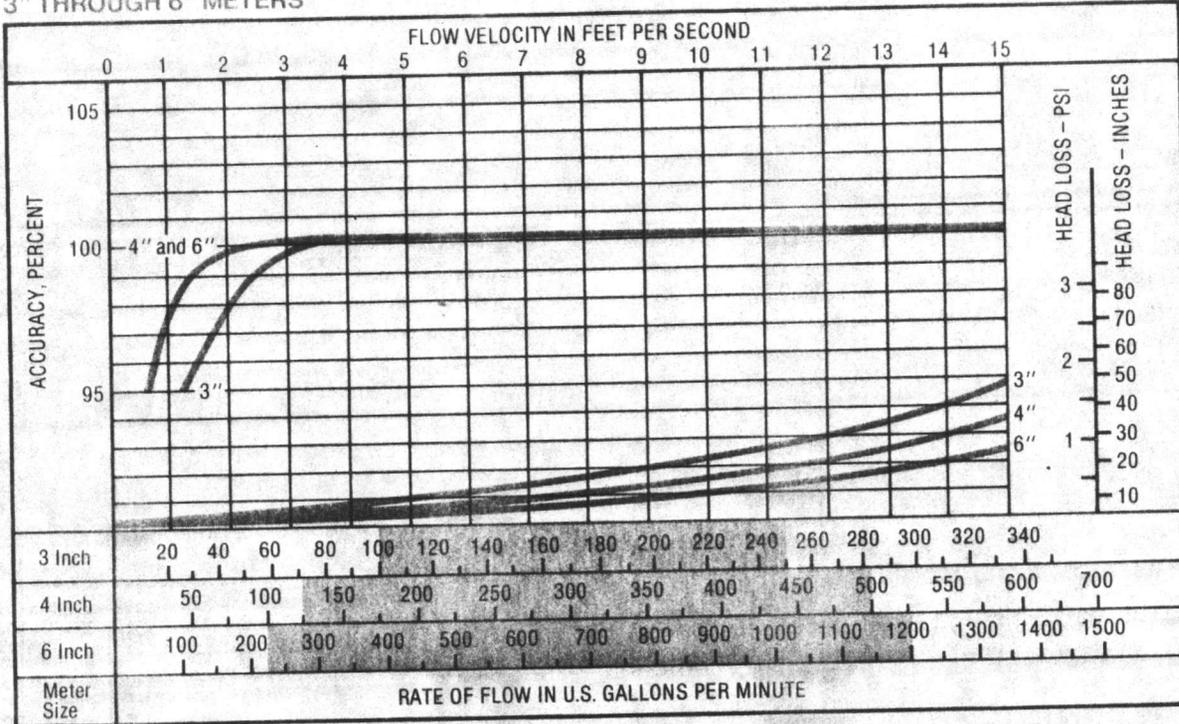


Rockwell

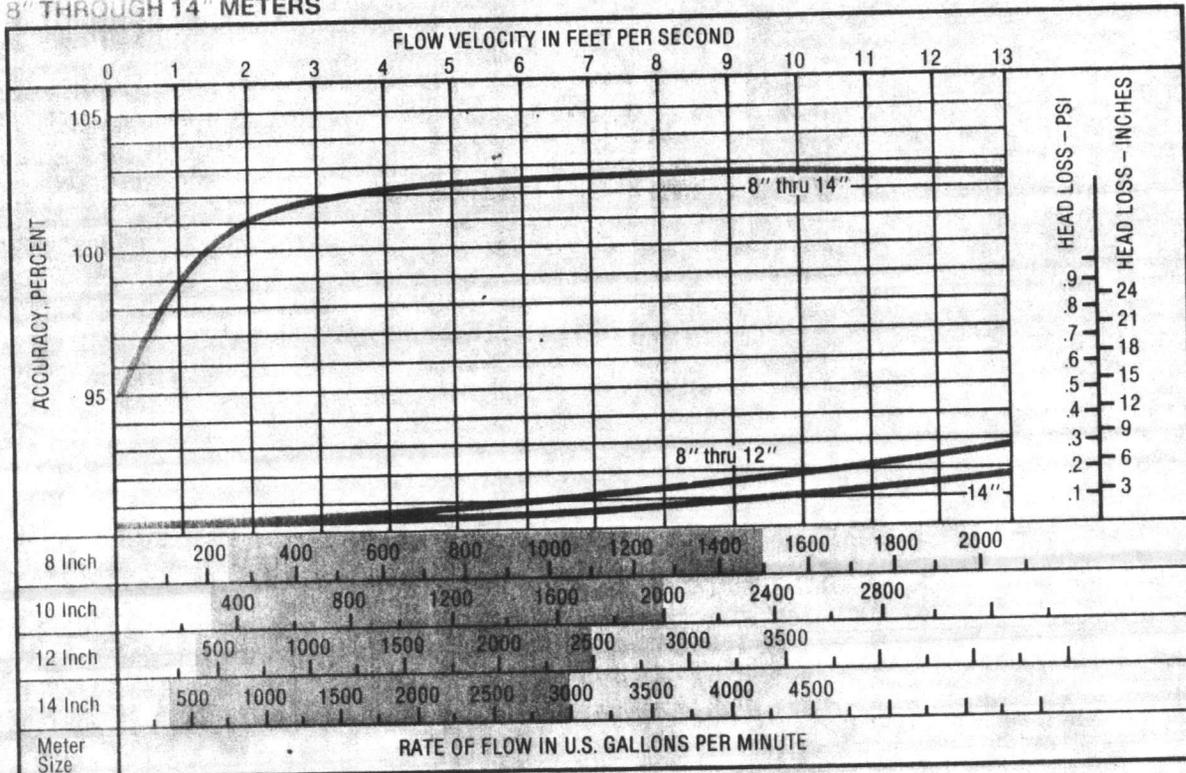
Propeller Meters

ACCURACY AND HEAD LOSS CURVES

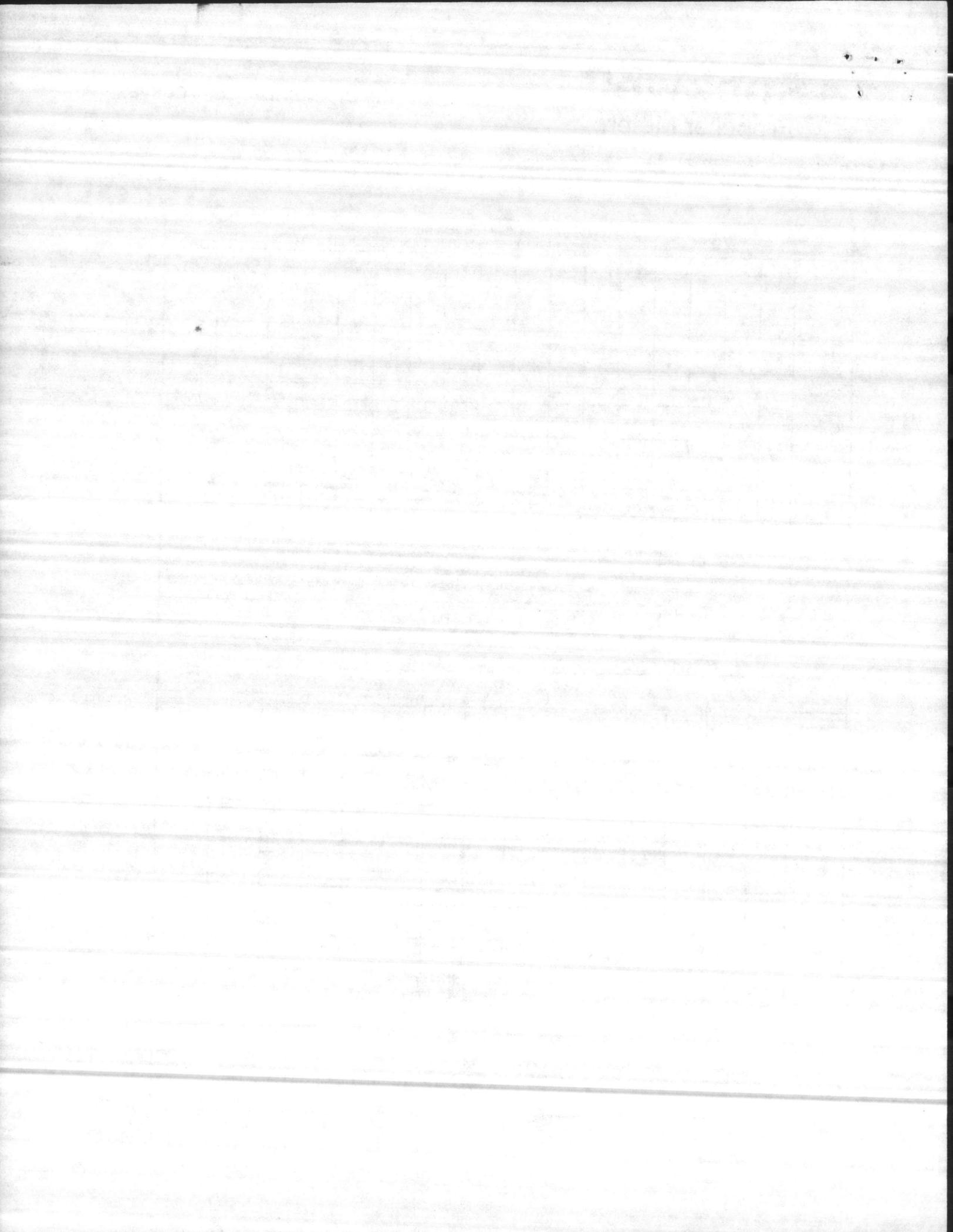
3" THROUGH 6" METERS



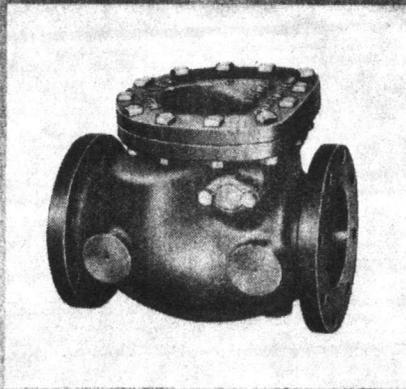
8" THROUGH 14" METERS



Low Flow
 Normal Flow Range
 Intermittent Flows



MUELLER® SWING-TYPE CHECK VALVES



Heavier duty to survive repetitive cycling

For water filtration, sewage treatment, power and pumping plants . . . drainage, irrigation and flood control projects . . . and similar applications where dependability and long life are important.

Many types of valves are rarely operated — sometimes only once or twice in their lifetime. But a check valve is often called on to cycle thousands, even millions of times. Heavy-duty design has to be standard with any check valve.

Mueller® Check Valves are more than that. They're heavy duty with extra features to give reliable, minimum-maintenance service over a period of years.

The basic design features a heavy cast iron body, fully bronze mounted with bronze (or rubber faced bronze) clapper disc accurately seated by a bronze clapper arm against a bronze seat ring. The design minimizes chatter and vibration.

The clapper of the gravity operated type swings from large diameter stainless steel hinge pins held in position by plugs. The clapper of the lever operated type is secured to a large diameter stainless steel shaft which turns in bronze bushings. The plugs or bushings are securely held in the valve body by cap screws — rather than screwed directly into the body — to prevent backing-out.

Plugs and bushings are sealed by O-rings, for more reliable sealing than with conventional packing. The O-rings that seal the shaft of the lever operated type are further protected by integral dirt seals.

Mueller Check Valves are available with standard mechanical joint ends in 3"-12" sizes or with flanged ends in 2-1/2"-24" sizes. Any model may be installed horizontally or vertically.

Gravity-operated check valves recommended for lines without sudden flow stoppages

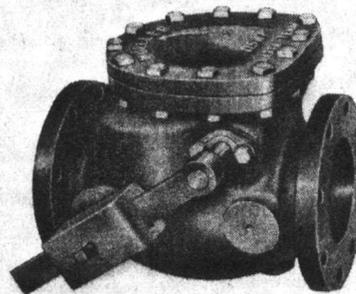
Lever and spring operated check valves recommended for lines having sudden flow stoppages

Lever and weight operated check valves recommended for lines having sudden flow stoppages

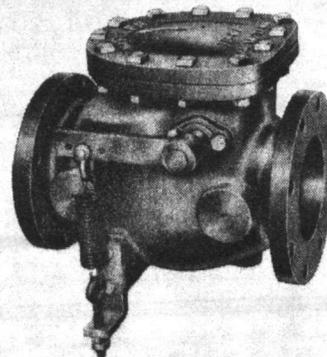
2-1/2"-12" — 175 psi (1207 kPa) working pressure, 350 psi (2413 kPa) test pressure

14"-24" — 150 psi (1034 kPa) working pressure, 300 psi (2068 kPa) test pressure

. . . for horizontal or vertical installation in cast iron and ductile iron pipe or class 200 cast iron O.D. PVC plastic pipe

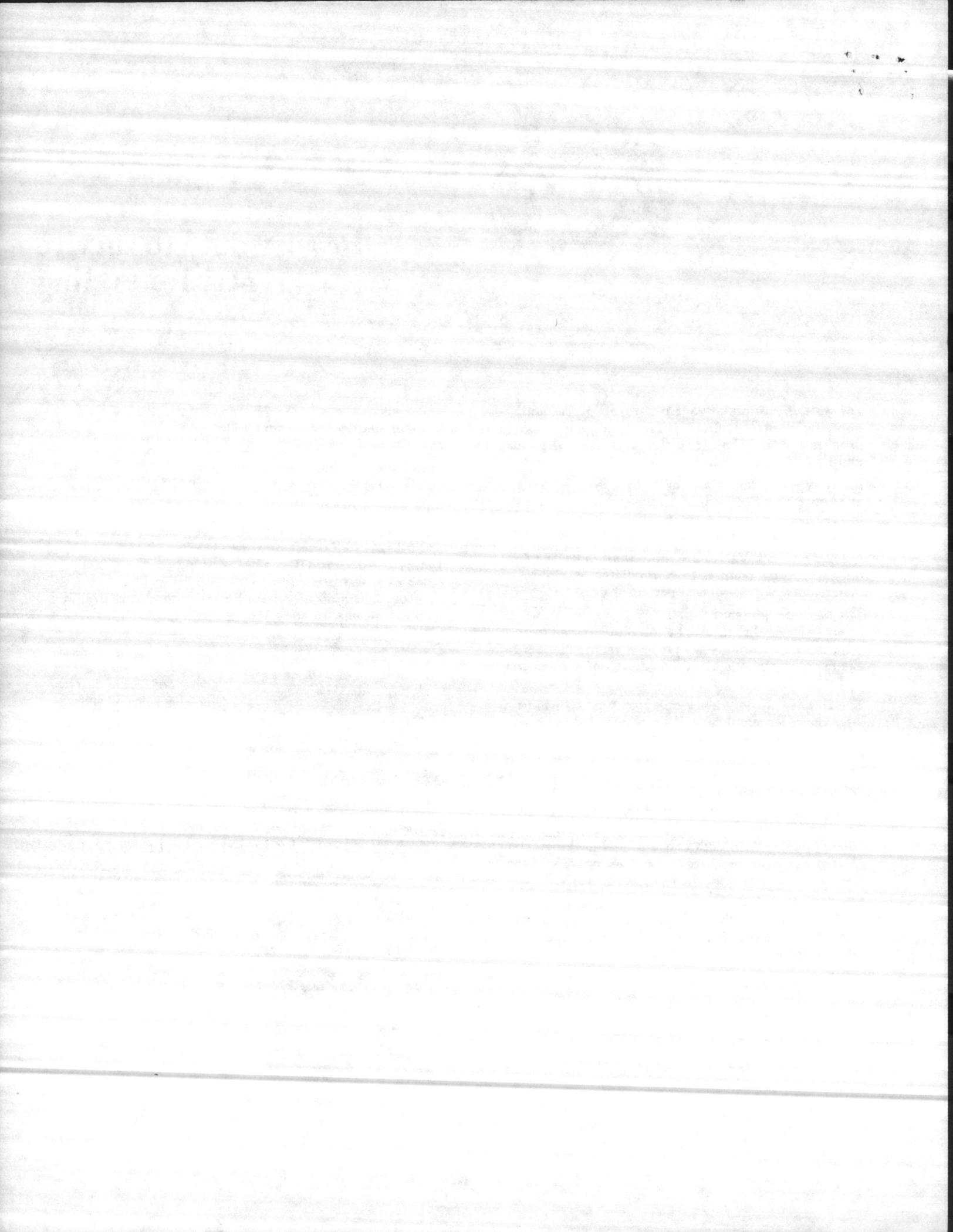


On lever and weight operated valves, the speed of closure can be altered by moving the weight along the lever. The lever can be installed on either side of the valve.

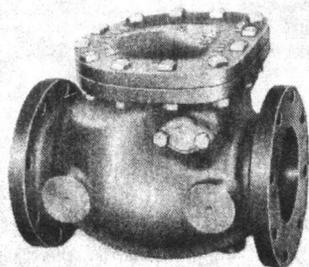


On lever and spring operated valves, the speed of closure can be selected, first by attaching the spring to any of the three holes in the lever arm, then "fine tuned" by tightening or loosening the bolt at the spring bracket. The lever and bracket can be installed on either side of the valve.

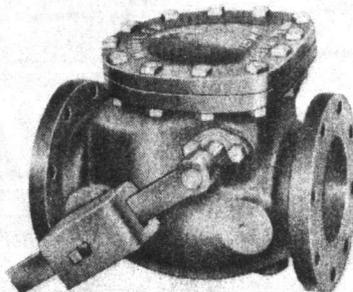
7



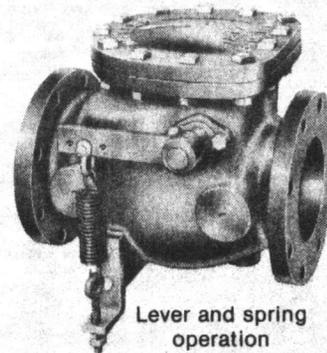
Mueller® Check Valves — iron body, bronze mounted



Gravity operation



Lever and weight operation



Lever and spring operation

Typical check valves

Working and test pressures

2-1/2"-12" sizes —

175 psi (1207 kPa) working pressure

350 psi (2413 kPa) test pressure

14"-24" sizes —

150 psi (1034 kPa) working pressure

300 psi (2068 kPa) test pressure

Check valves

Type of ends	Catalog number	Disc ring material		Type of operation			Sizes*													
		Bronze	Rubber	Gravity	Lever & weight	Lever & spring	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	
Flanged ends†	A-2600-6	•		•			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2602-6		•	•			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2600-6-01	•			•		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2602-6-01		•		•		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2600-6-02	•				•	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2602-6-02		•			•	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Standard mechanical joint ends**	A-2600-20	•		•			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2602-20		•	•			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2600-20-01	•			•		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2602-20-01		•		•		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2600-20-02	•				•	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A-2602-20-02		•			•	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

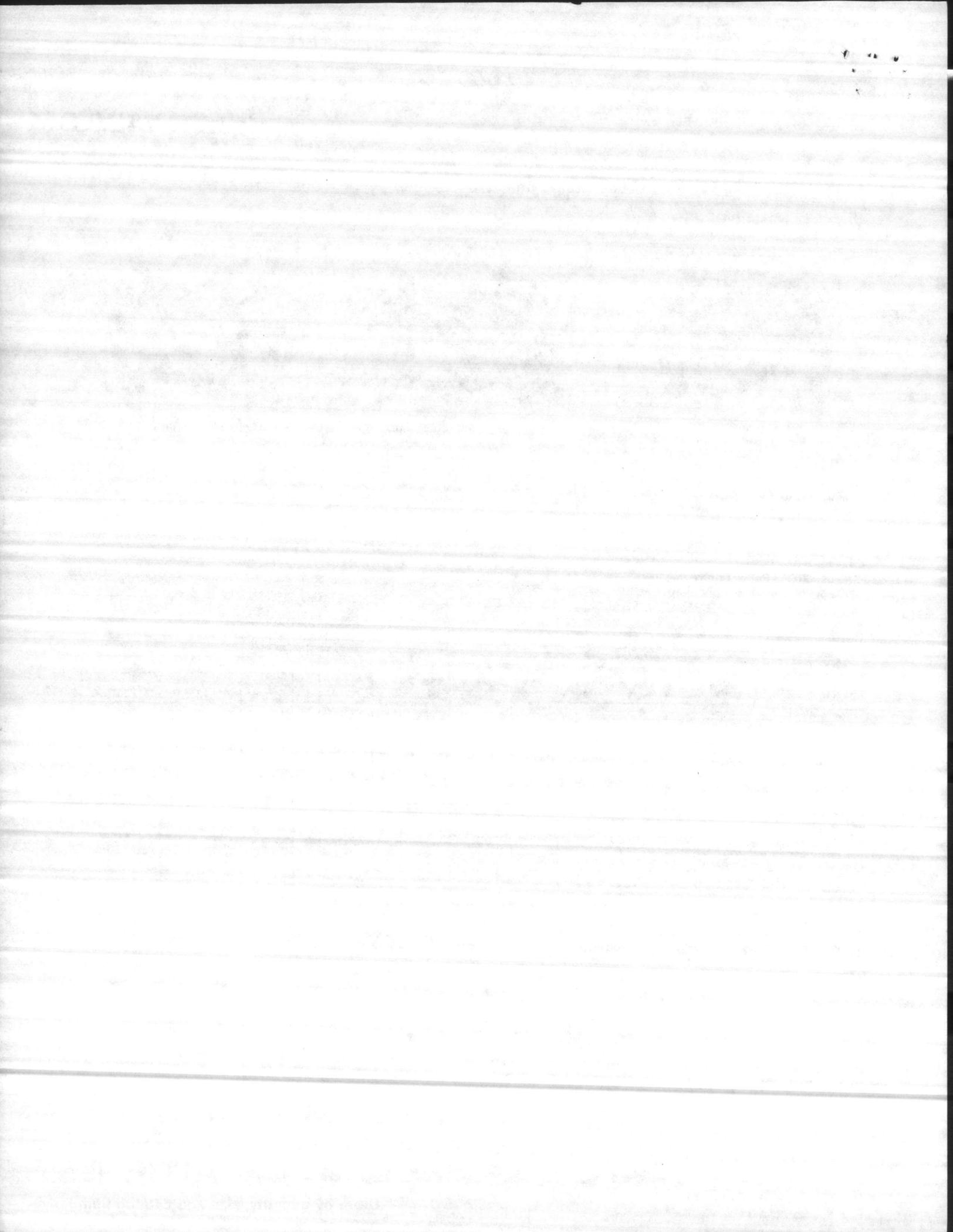
*Nominal sizes.

**Standard mechanical joint ends are furnished with bolts, glands and rubber gaskets. Dimensions comply with AWWA C111 and ANSI A21.11 and fit classes 150 and 200 cast iron, ductile iron and class 200 cast iron O.D. PVC plastic pipe.

†Flanged end dimensions comply with ANSI B16.1.

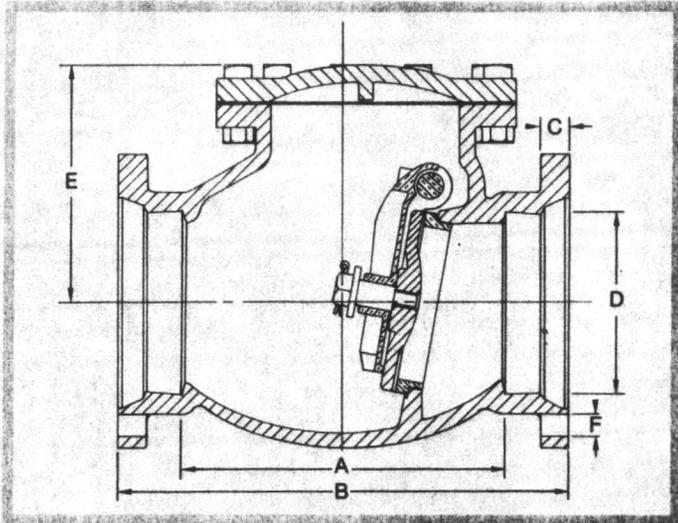
MUELLER CO. DECATUR, ILL.

Order by quantity, size and catalog number

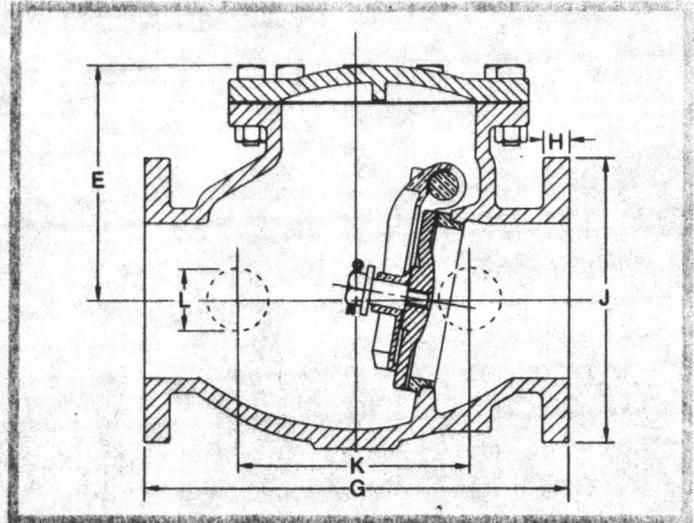


CHECK AND DETECTOR CHECK VALVES DIMENSIONS — CHECK VALVES

Dimensions — Mueller® Check Valves



Mechanical joint ends



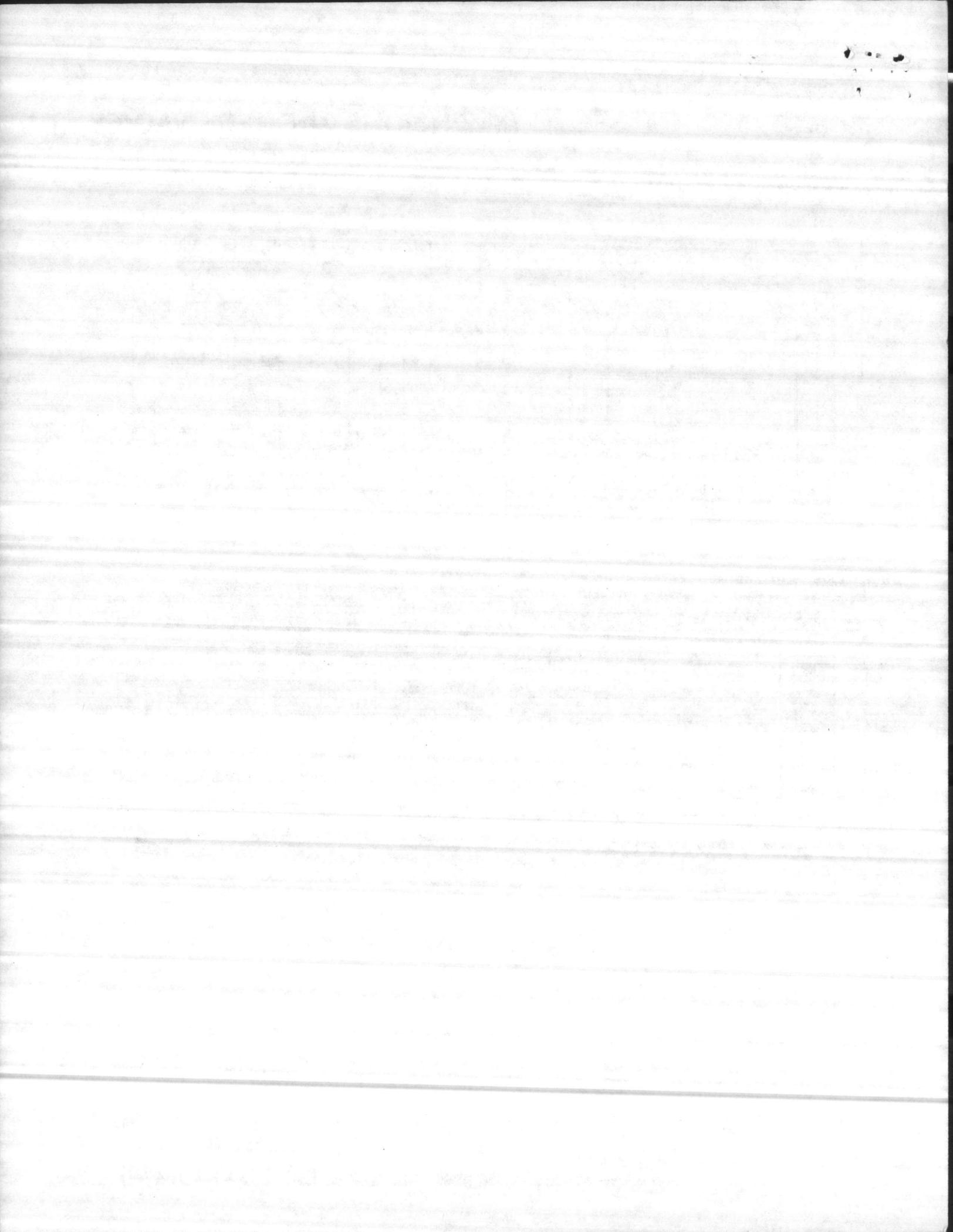
Flanged ends

Dimensions — inches

Dimension	Size of valve*												
	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
A	—	13 1/2	15	—	17 1/2	20	22 1/4	25 1/2	—	—	—	—	—
B	—	8 1/2	10	—	12 1/2	15	17 1/4	20 1/2	—	—	—	—	—
C	—	1 9/16	1	—	1 1/16	1 1/8	1 3/16	1 1/4	—	—	—	—	—
D	—	3.96	4.80	—	6.80	9.05	11.10	13.20	—	—	—	—	—
E	5 3/4	6 1/4	7 1/4	8 1/4	9	10 1/2	12 1/4	14 1/4	16 1/2	20 1/2	22	23 1/4	28 9/16
F**	—	4 — 3/16	8 — 3/4	—	12 — 3/4	12 — 3/4	16 — 3/4	16 — 3/4	—	—	—	—	—
G	9 3/4	10 5/8	12 7/8	14 1/8	16 1/2	19 1/2	21 1/2	24 1/8	29 1/2	30 1/2	33 1/2	40	46
H	1 1/16	3/4	1 9/16	1 9/16	1	1 1/8	1 3/16	1 1/4	1 3/8	1 7/16	1 9/16	1 11/16	1 7/8
J	7	7 1/2	9	10	11	13 1/2	16	19	21	23 1/2	25	27 1/2	32
K	5 7/8	6 1/4	7	8 1/8	9 3/8	11 1/2	13 3/4	15 1/2	18 1/8	21 1/4	23	24	28 1/2
L	2	2 3/8	2 11/16	2 11/16	3 1/4	3 1/4	3 1/4	3 1/4	4 3/8	3 3/8	4 1/4	4 1/4	6

*Nominal sizes.

**First number is number of bolts for each joint.





INSTALLATION AND OPERATING INSTRUCTIONS FOR THE MODEL A-18 AND A-20 TYPES J & R

The type "J"-6 Charger is for use with 3 cell batteries (6 volt). The type "J"-12 is for use with 6 cell batteries (12 volt).

The type "R"-24 La Marche Automatic Battery Charger is for use with batteries of 12 cell (24 volts). Type 30/36 is for use with batteries of either 15, 16 or 18 cells. If the above models are designed for use with nickel cadmium or nickel iron batteries, this will be indicated on the name plate.

Except for the difference in voltage, the installation, setting, and operation of the types "J" and "R" are identical and the following applies to either charger.

To remove the cover, unscrew one screw on each side and the screw in the center of the front, then slide the cover up. This exposes the terminal strip with the three compensation tap settings and the battery change taps. The battery voltage is indicated on the battery change taps and it is only necessary to shift the wire from the voltage setting it is on, to the other terminal marked with the desired battery voltage.

After removing the cover, you can make your A.C. input and battery connections from the terminal board. In ALL CASES the POSITIVE wire on the charger is connected to the POSITIVE terminal of the battery, and the NEGATIVE WIRE on the charger is connected to the NEGATIVE terminal of the battery.

The compensation taps are marked LOW, NORMAL, and HIGH. These designations refer to the OUTPUT VOLTAGE of the charger. Thus in a case where a hydrometer reading on a battery, not drawing charging current, reads consistently low, the compensation tap should be moved to the tap marked HIGH. These chargers are always shipped with the compensation tap on NORMAL, and this setting does not need to be changed except in rare instances on continuously very high or very low line voltage.

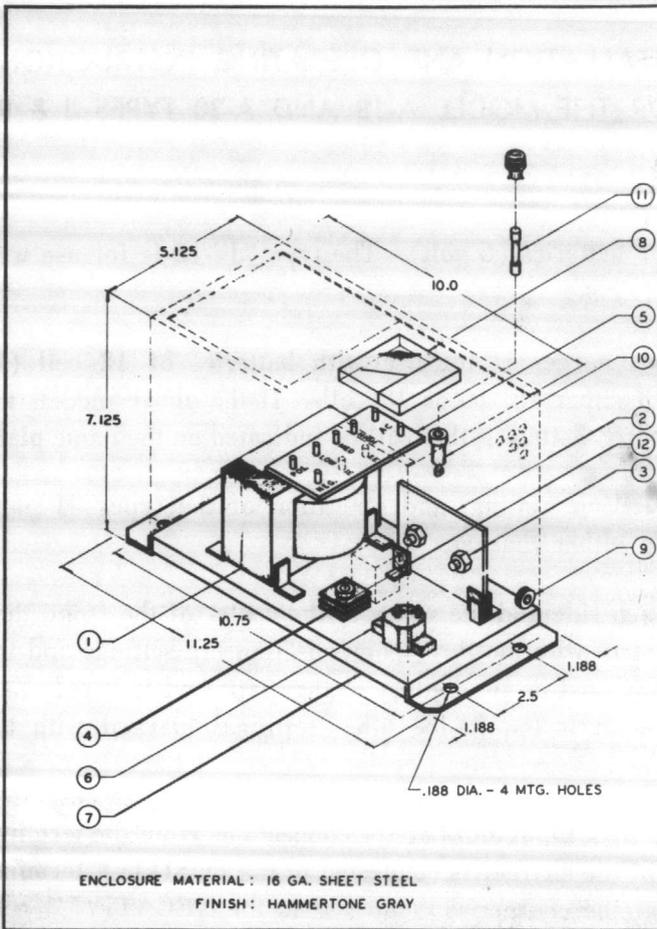
A LA MARCHE Automatic Battery Charger does NOT show any appreciable current flow on the ammeter while it is connected to a fully charged battery. This is your GUARANTEE that the battery is being correctly maintained at full charge but not being overcharged. To bring the charger into operation, the battery must be discharged slightly by throwing a load on it for a few minutes or by disconnecting the charger for an hour or so.

These chargers are convection cooled and must be mounted upright in a vertical position. NEVER mount directly over the batteries. When used in cabinets such as engine control panels or switching panels, the case is removed permanently and the ammeter is placed on the main control panel.

**MANUFACTURERS AND ORIGINATORS OF THE WORLD'S MOST COMPLETE LINE
OF MAG-AMP. REGULATED AUTOMATIC BATTERY CHARGERS**

LA MARCHE
Manufacturing Company

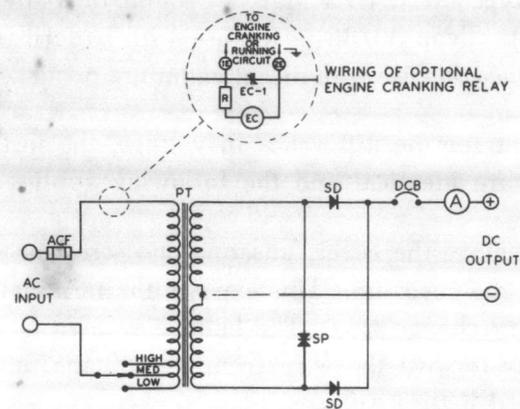
106 Bradrock Drive, Des Plaines, Illinois 60018
Phone: 299-1188 (A.C. 312) Telex: 282526



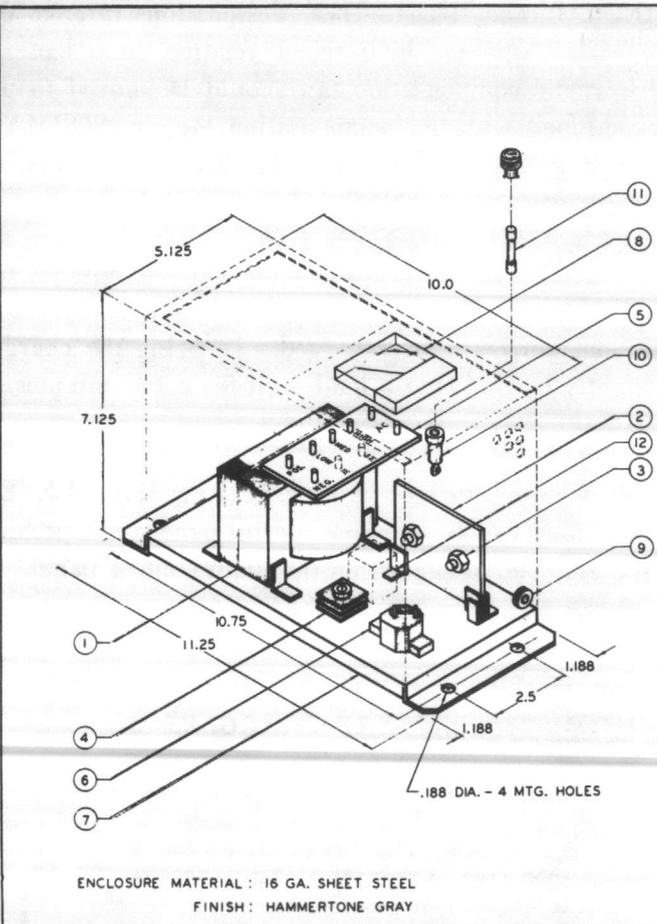
ENCLOSURE MATERIAL: 16 GA. SHEET STEEL
FINISH: HAMMERTONE GRAY

ITEM	PART NO.	REQ'D	DESCRIPTION	Δ
1	A1-CA-IC-B48	1	TRANSFORMER ASSY.	PT
2	AS1-3	1	SILICON DIODE HEATSINK	
3	PI00-249C	2	SILICON DIODE - POSITIVE	SD
4	P343-A1	1	SURGE PROTECTOR	SP
5	TI00-1-C1C	1	TERMINAL BOARD (TI00-BE-C1C WITH ITEM 2)	
6	P5-4	1	CIRCUIT BREAKER	DCB
7	P84	1	ENCLOSURE NO. 02	
8	P3-5	1	DC AMMETER 0-5	A
9	PI05	3	RUBBER GROMMETS	
10	PI6-D1-B15	1	FUSEHOLDER	
11	P8-D1-B3	1	FUSE 3A 250 VAC	ACF
12	P267-M4	1	OPTIONAL - ENGINE CRANKING RELAY	EC

* = RECOMMENDED SPARE PARTS
Δ = SCHEMATIC WIRING DIAGRAM



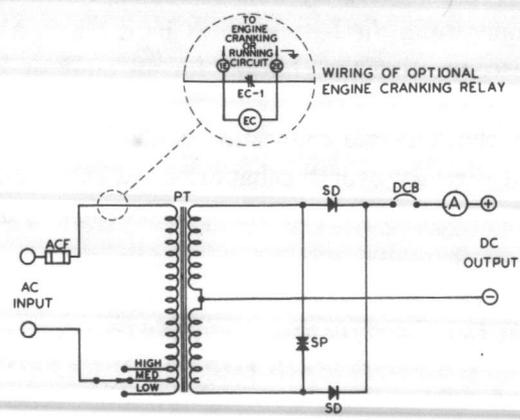
ASSEMBLY DETAILS OF MODEL A18 'J' STANDARD UNIT AND OPTIONAL CRANKING RELAY			
LA MARCHÉ MFG. CO.			
106 BRADROCK DR. DEER PLAINES, ILL.			
DATE	SCALE	DESIGNED BY	DRG. NO.
ECN 886	2-22-77	2	A18-1
REV. 1	12-28-78		
REV. 2			
REV. 3			



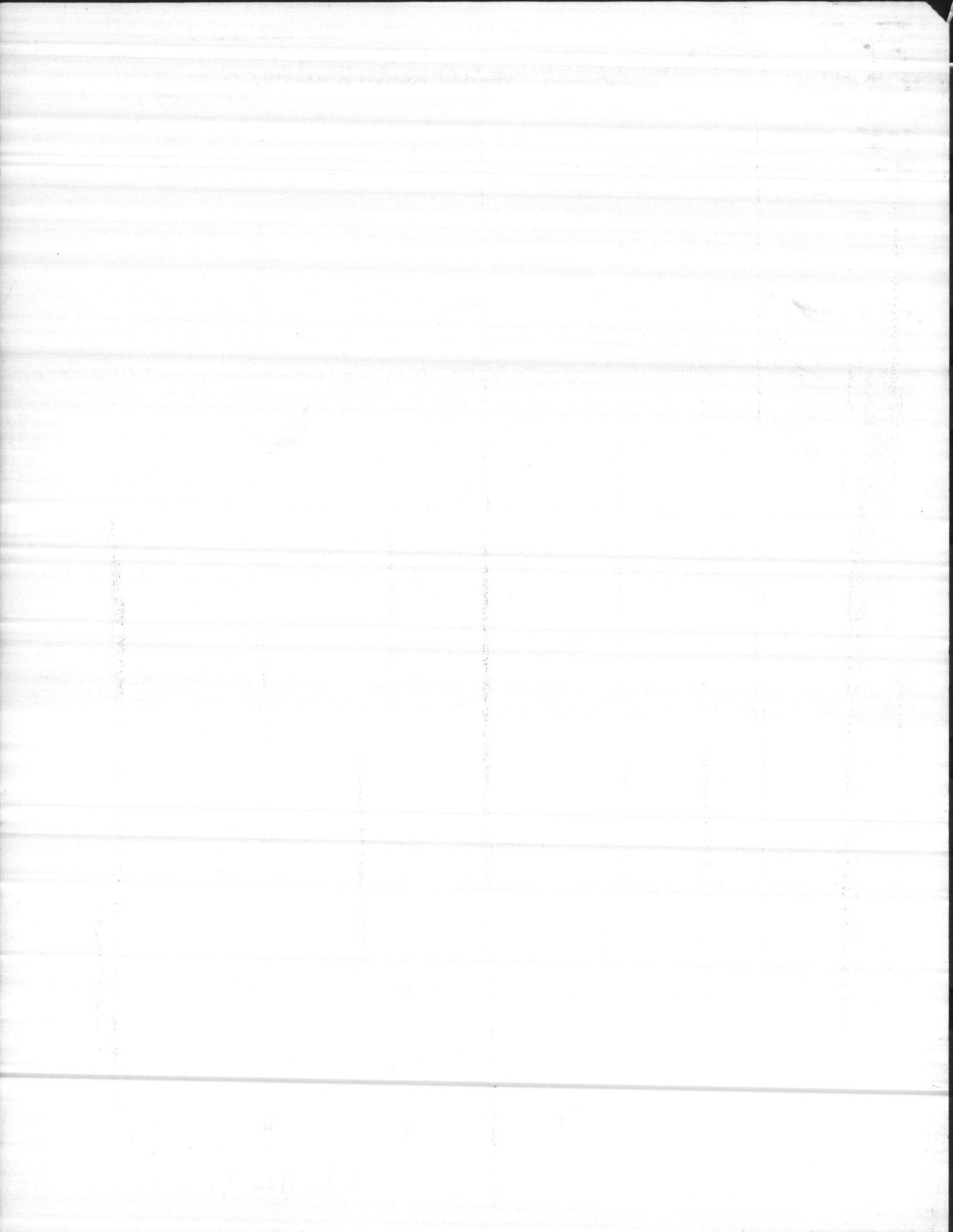
ENCLOSURE MATERIAL: 16 GA. SHEET STEEL
FINISH: HAMMERTONE GRAY

ITEM	PART NO.	REQ'D	DESCRIPTION	Δ
1	A1-DA-IE-B48	1	TRANSFORMER ASSY.	PT
2	AS1-3	1	SILICON DIODE HEATSINK	
3	PI00-250C	2	SILICON DIODE - POSITIVE	SD
4	P343-A2	1	SURGE PROTECTOR	SP
5	TI00-1-DIE	1	TERMINAL BOARD (TI00-BE-DIE WITH ITEM 2)	
6	P5-6	1	CIRCUIT BREAKER	DCB
7	P84	1	ENCLOSURE NO. 02	
8	P3-5	1	DC AMMETER 0-5	A
9	PI05	3	RUBBER GROMMETS	
10	PI6-D1-B15	1	FUSEHOLDER	
11	P8-D1-B3	1	FUSE 3A 250 VAC	ACF
12	P267-M5	1	OPTIONAL - ENGINE CRANKING RELAY	EC

* = RECOMMENDED SPARE PARTS
Δ = SCHEMATIC WIRING DIAGRAM



ASSEMBLY DETAILS OF MODEL A20 R '24' VOLT UNIT AND OPTIONAL CRANKING RELAY			
LA MARCHÉ MFG. CO.			
106 BRADROCK DR. DEER PLAINES, ILL.			
DATE	SCALE	DESIGNED BY	DRG. NO.
12-30-88			A20-2
REV. 1	12-31-83		
REV. 2			
REV. 3			

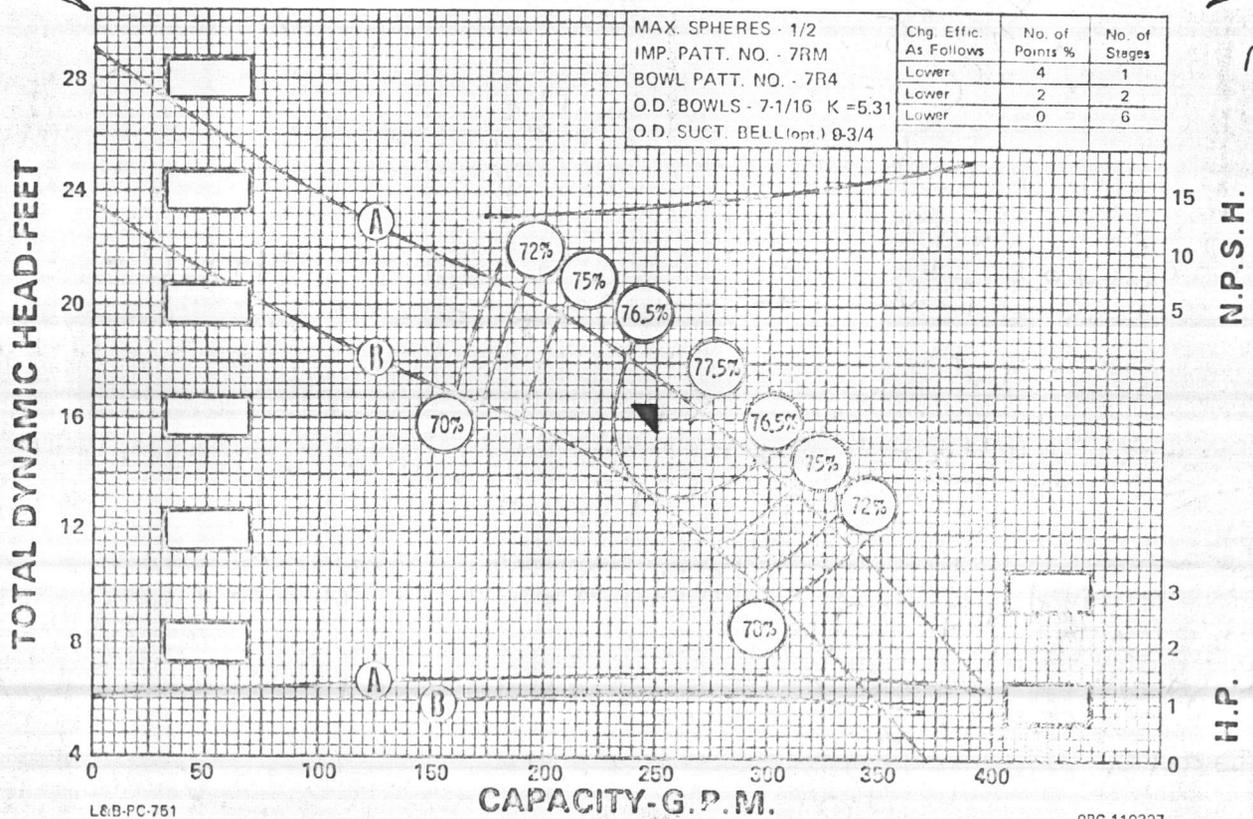
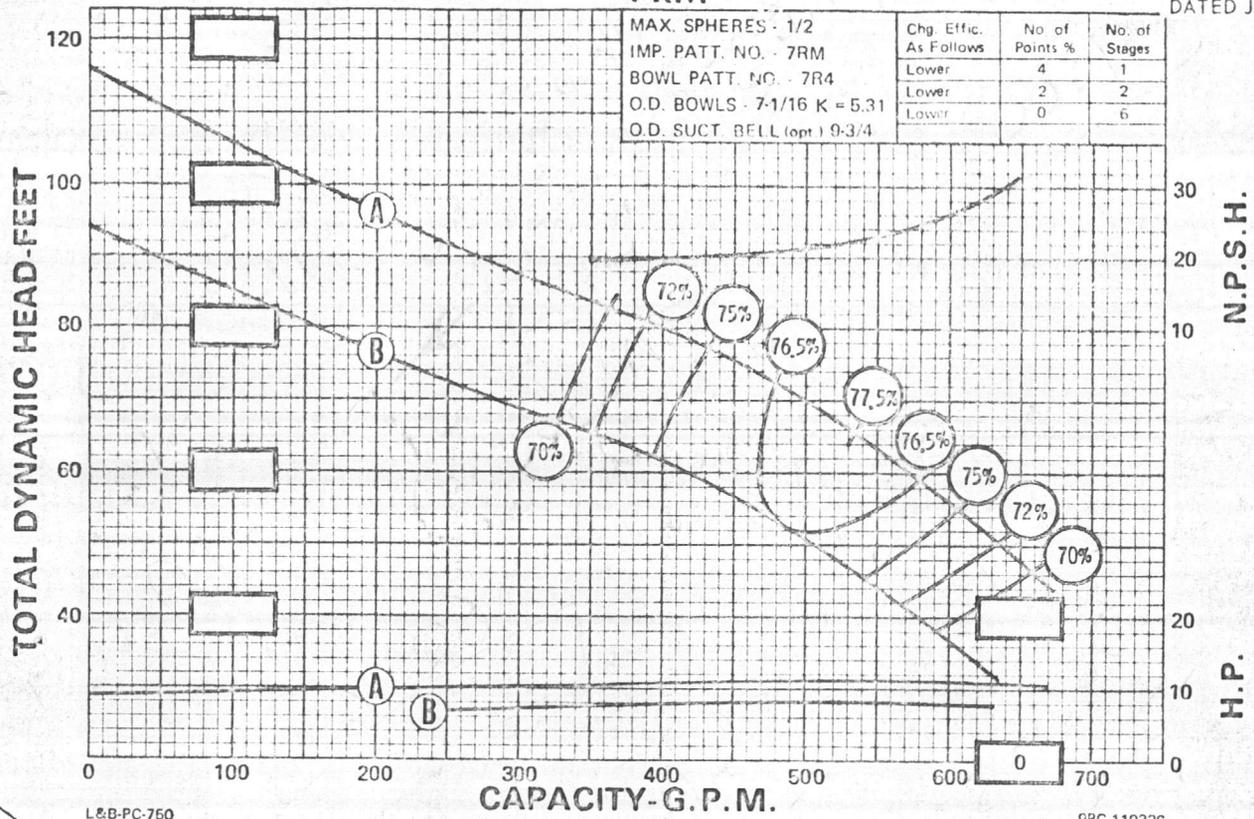


Veri-Line PUMP

DATED FEBRUARY 1973

7RM

SUPERSEDES PAGE 461
DATED JULY 1972



M-267



AURORA PUMP
 A UNIT OF GENERAL SIGNAL
 800 AIRPORT ROAD-NORTH AURORA ILLINOIS-60542

NUMBER OF STAGES REQUIRED FOR APPLICATION
 STANDARD CURVE ILLUSTRATES SINGLE STAGE PERFORMANCE ONLY

9:00

Fukson
introp
Shems W
Ch. Ford
543-1510
Orr Calder
791-1162
Husn
Ryan
762 6657
791-3301

John Meloy
Ballard
762-3976
Susan Fuller

Mell Fuller
762
6248
800 191 6058

1 Gracie ^{1:39} ^{Land} ~~Summa~~ - 762-2621-ABC-

3 ^{Furson} John Stokes 919 484-5181

4. fu 762-2621 9.52.

5. Reicher ~~Herf~~
Mrs. Miller - OICC - 451-2581

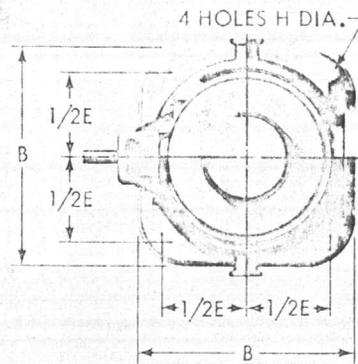
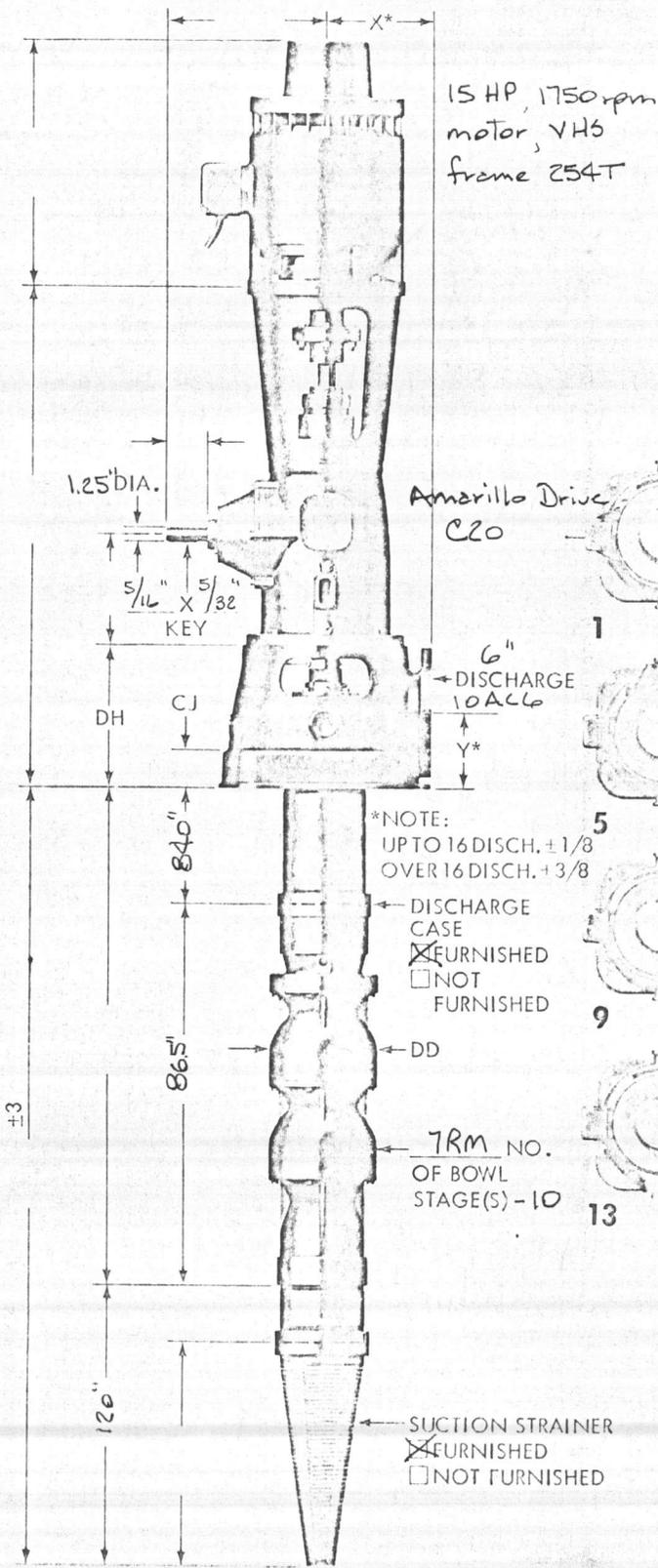
2019

\$2.00 per m

Bond

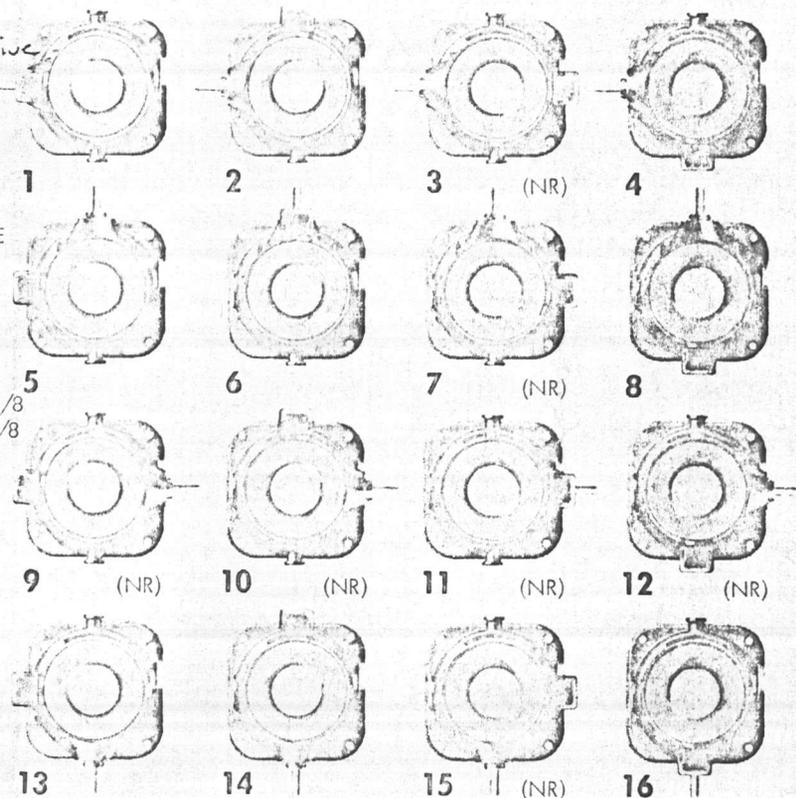
AURORA 1130 SERIES PUMPS

COMBINATION RIGHT ANGLE GEAR DRIVE CAST ABOVE SURFACE "AC & R" DISCHARGE HEAD — CONE STRAINER



M-267

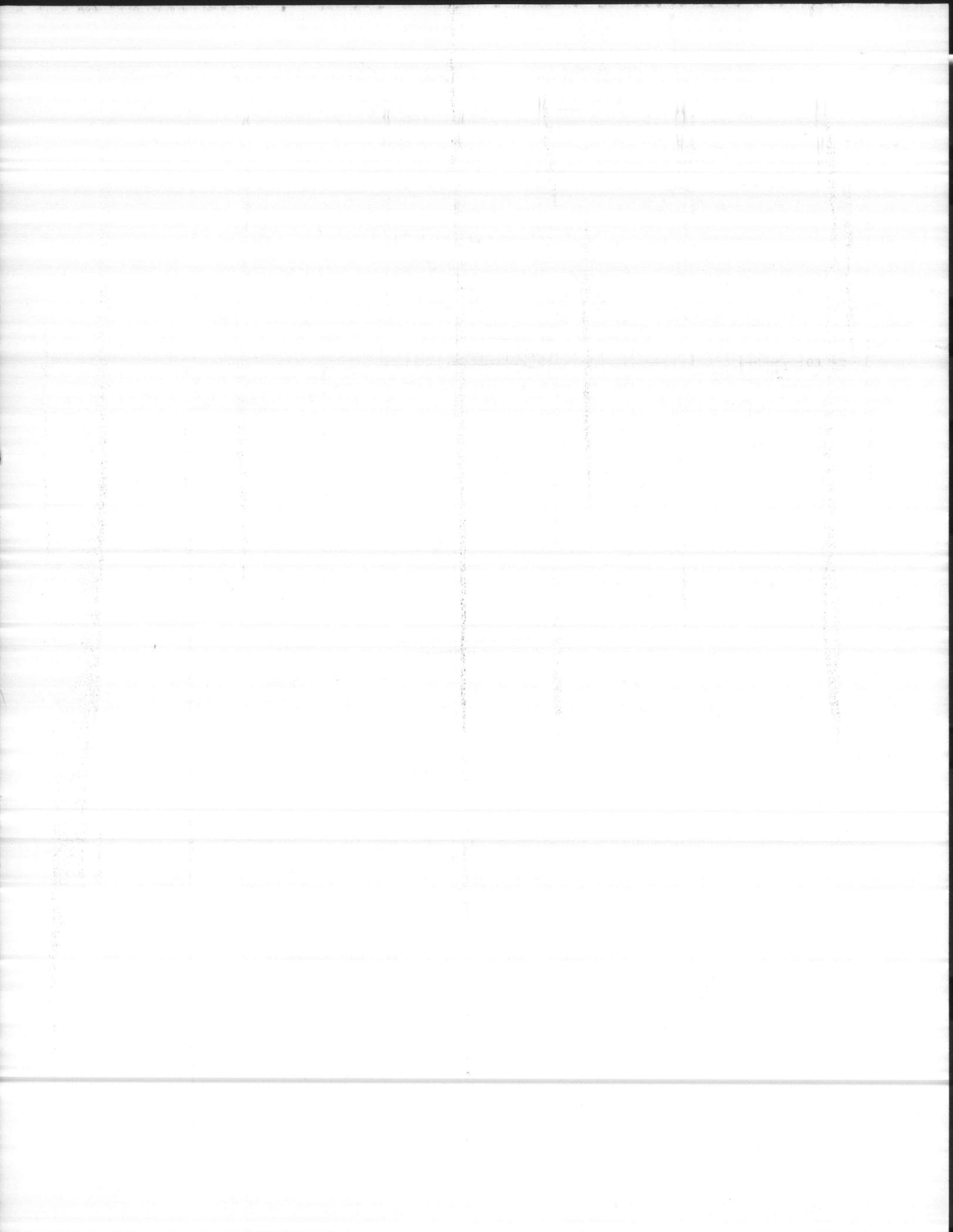
ALTERNATE CONDUIT BOX
AND DRIVE SHAFT POSITIONS



- NOTES:
1. All dimensions in inches.
 2. Component dimensions may vary $\pm 1/8$.
 3. Not for construction purposes unless certified.
 4. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
 5. Motor and gear drive to be mounted by others.
 6. Discharge flange is American Standard flat face 125# ANSI. Bolt holes — strad. vert. ϕ .
 7. Ideal universal joint operating angle is 1° to 5° .
 8. NA — not applicable.
 9. NR — not recommended.



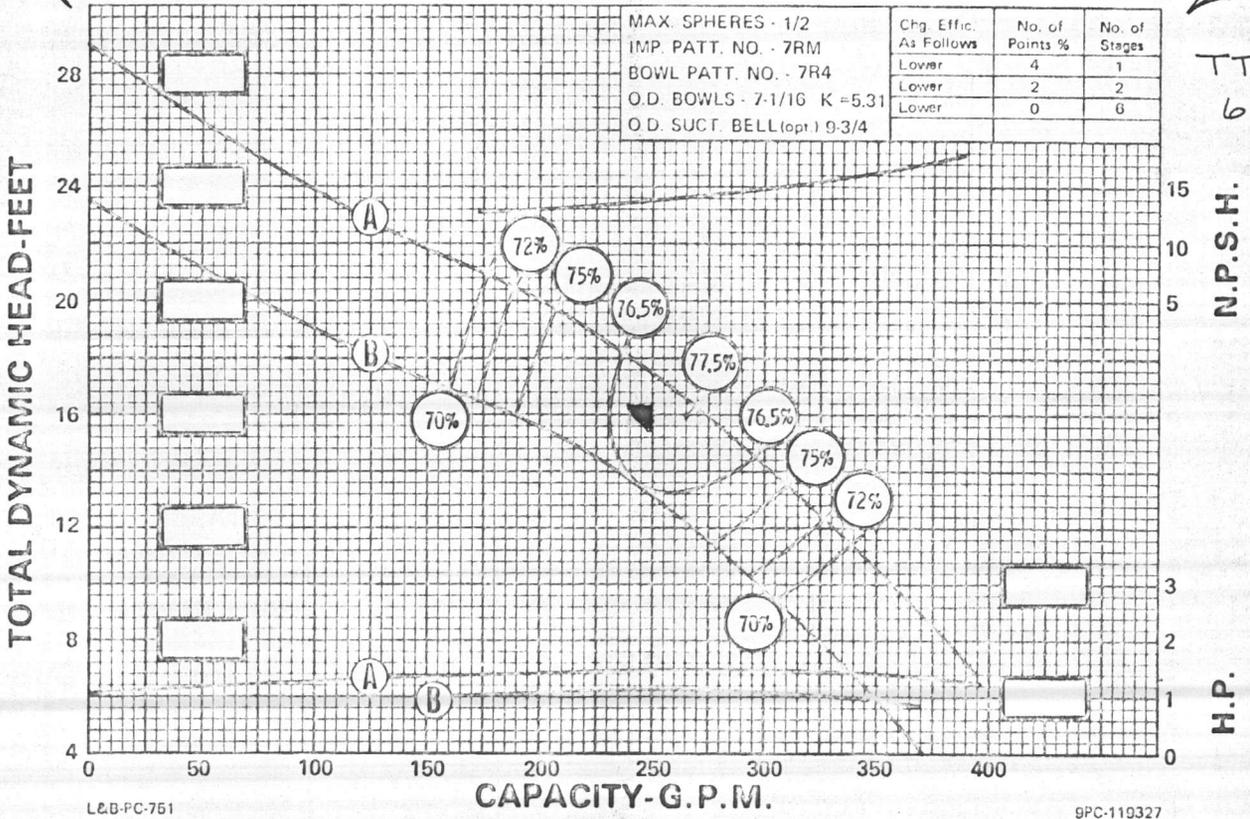
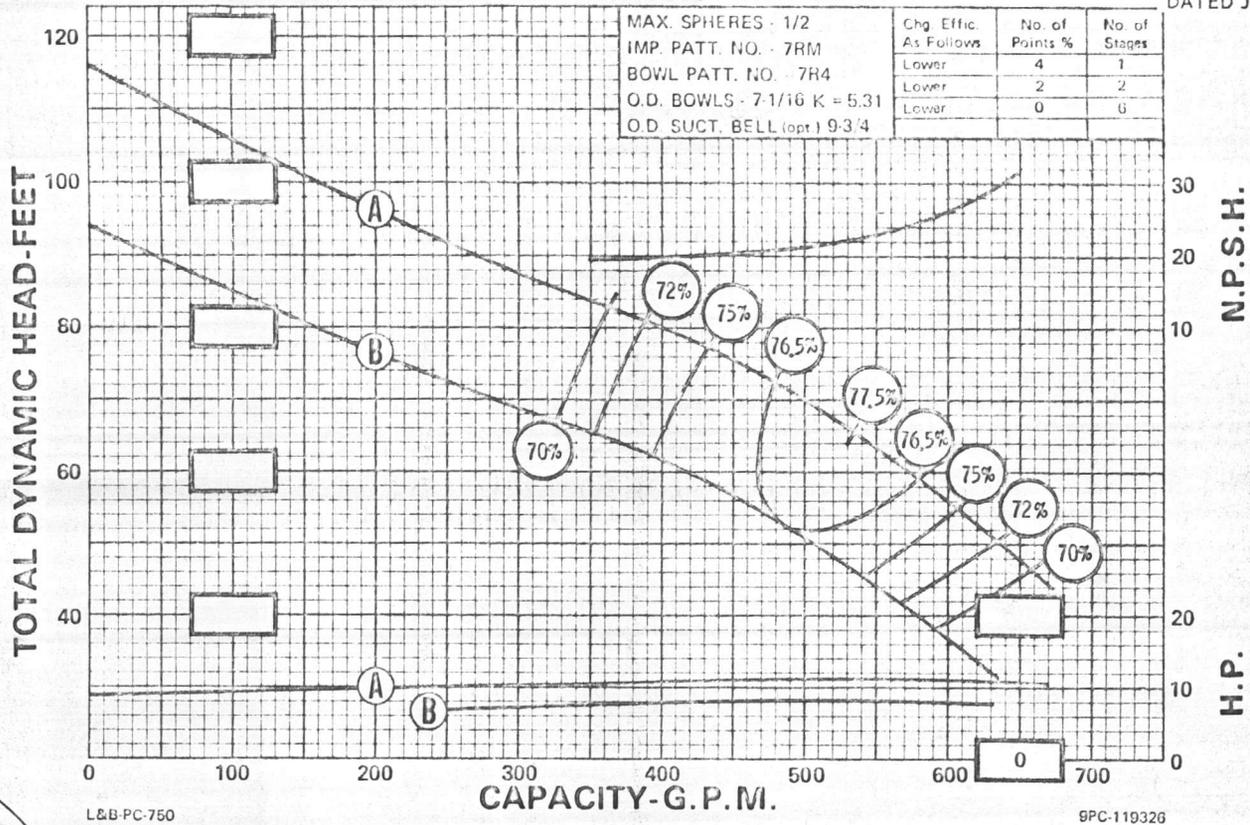
AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD - NORTH AURORA, ILLINOIS - 60542



Verti-Line PUMP
7RM

DATED FEBRUARY 1973

SUPERSEDES PAGE 461
DATED JULY 1972

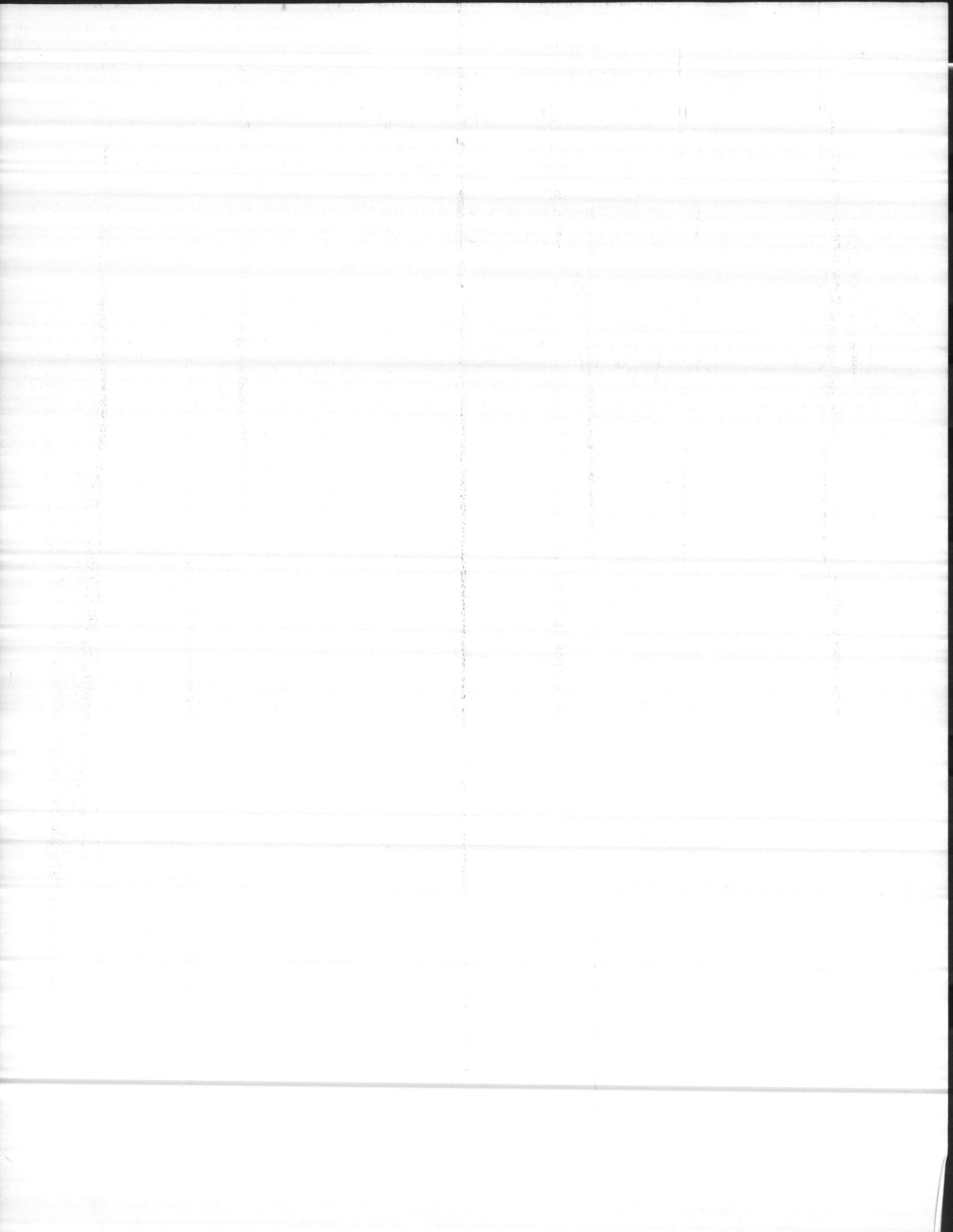


TT-25
655



AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD-NORTH AURORA, ILLINOIS-60542

NUMBER OF STAGES REQUIRED FOR APPLICATION
STANDARD CURVE ILLUSTRATES SINGLE STAGE PERFORMANCE ONLY



AIR RELEASE VALVES

WHY and WHERE to use

An Air Release Valve has a small venting orifice and is used wherever air is entrained in water under pressure. These pockets of air increase the resistance to the flow of water; and in critical installations, can reduce the capacity of a line down to zero. The most serious feature of this increased resistance however, is that most installations may suf-

fer only a small increased resistance of say 10 or 15%. The increased resistance may be overcome by the pump using more power than necessary to move the required amount of water. Such a loss can continue unnoticed for years and is the reason why all points where air can collect should be equipped with APCO Air Release Valves.

3/4" NO. 61 PHYSICAL DIMENSIONS
 Height... 5 1/2" Weight... 2 1/2 #
 Width... 2 1/4"
 Inlet—3/4" pipe thread
 All Bronze
 75 P.S.I. Maximum Working Pressure

1" NO. 75 PHYSICAL DIMENSIONS
 Height... 9 1/4" Weight... 11 #
 Width... 5 1/4"
 Inlet—1" pipe thread

1/2" NO. 55 PHYSICAL DIMENSIONS
 Height... 5" Length... 6 3/8"
 Width... 3 5/8" Weight... 5 1/2 #
 Inlet—1/2" pipe thread

3/4" NO. 65 PHYSICAL DIMENSIONS
 Height... 7" Length... 8 1/2"
 Width... 4 1/2" Weight... 9 #
 Inlet—3/4" pipe thread

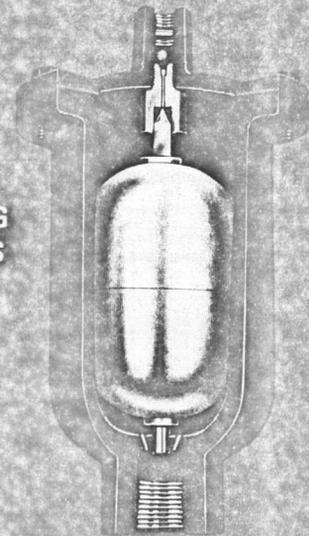
Also Use On...

1. Centrifugal Pumps
2. Hydropneumatic Tanks
3. Pipe Lines
4. Enclosed Systems
5. Sewage Lines

For Selection Data See Bulletin 610 or Page 2
 Catalog 726

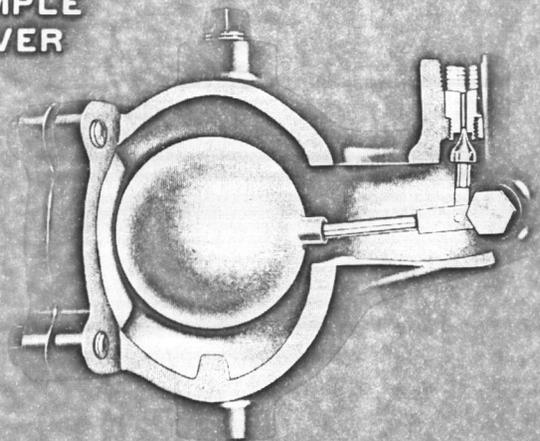
DIRECT ACTING

SPECIFY IF
 OPERATING
 PRESSURES
 BELOW
 20 PSI



Good For Pressures up to 150 P.S.I.

SIMPLE LEVER

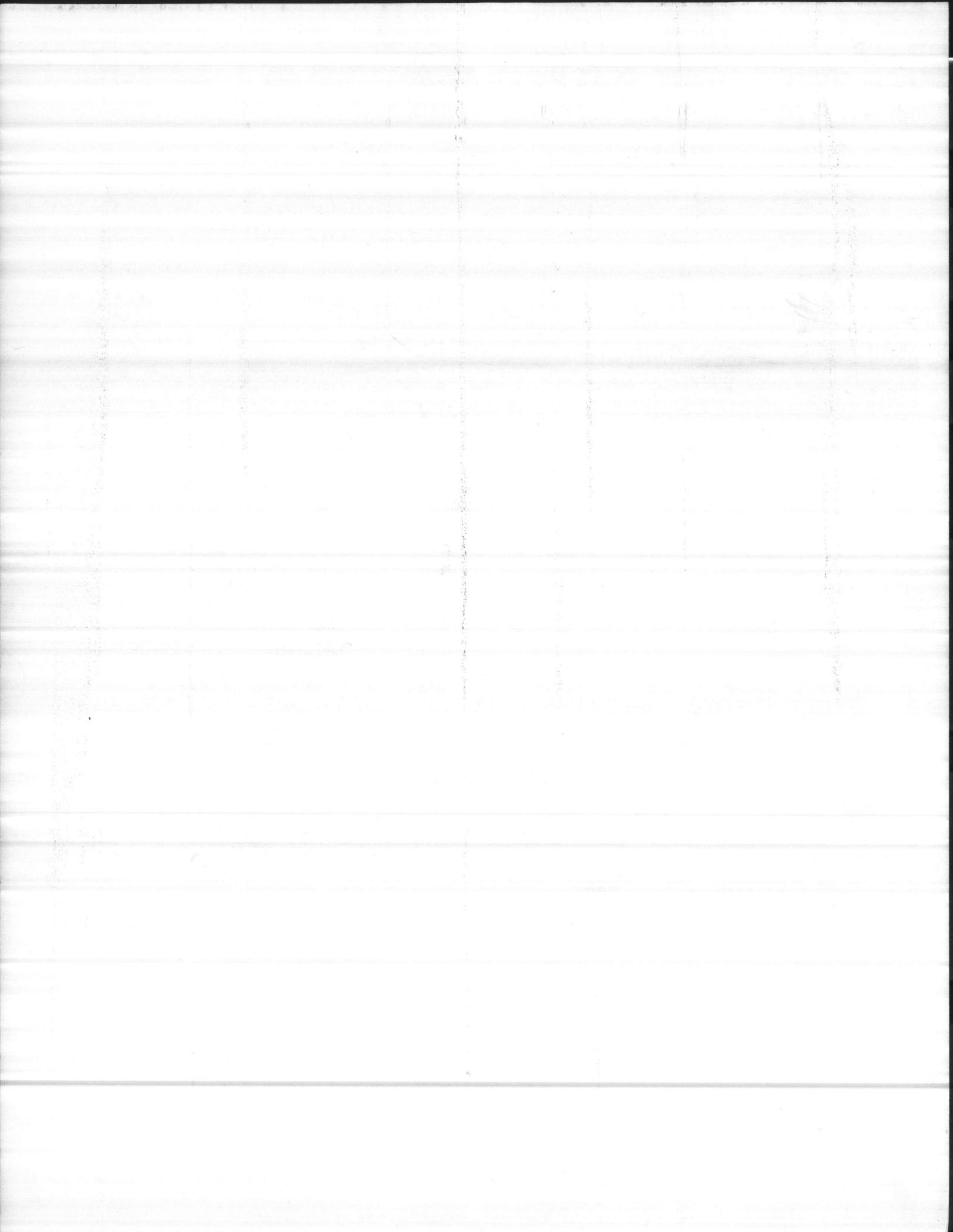


Good For Pressures up to 150 P.S.I.

APCO Uses Stainless

Examine these exclusive features which

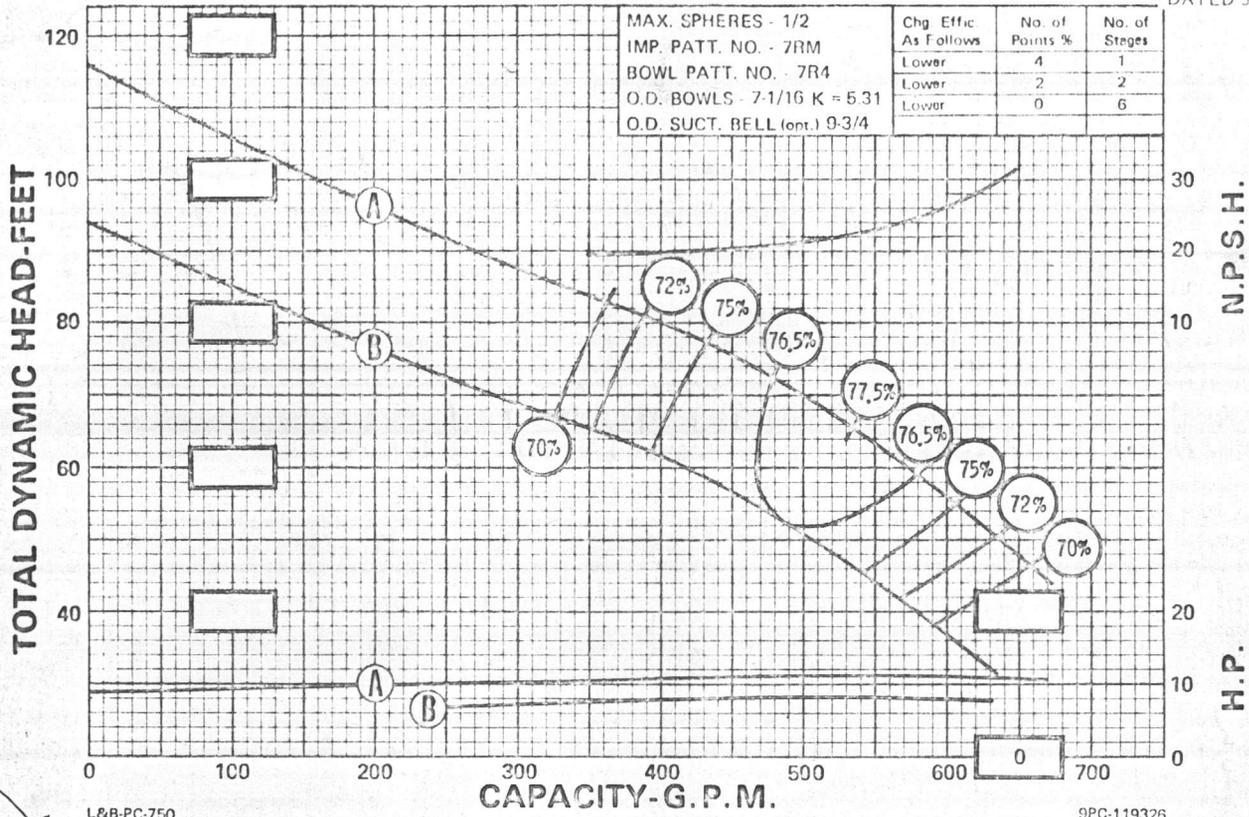
1. Insures full efficiency of line operation
2. Conserves pump horse power—no restricted high points
3. Stainless steel floats—guaranteed for 1000 P.S.I.



Veri-Line PUMP
7RM

DATED FEBRUARY 1973

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DATED JULY 1972

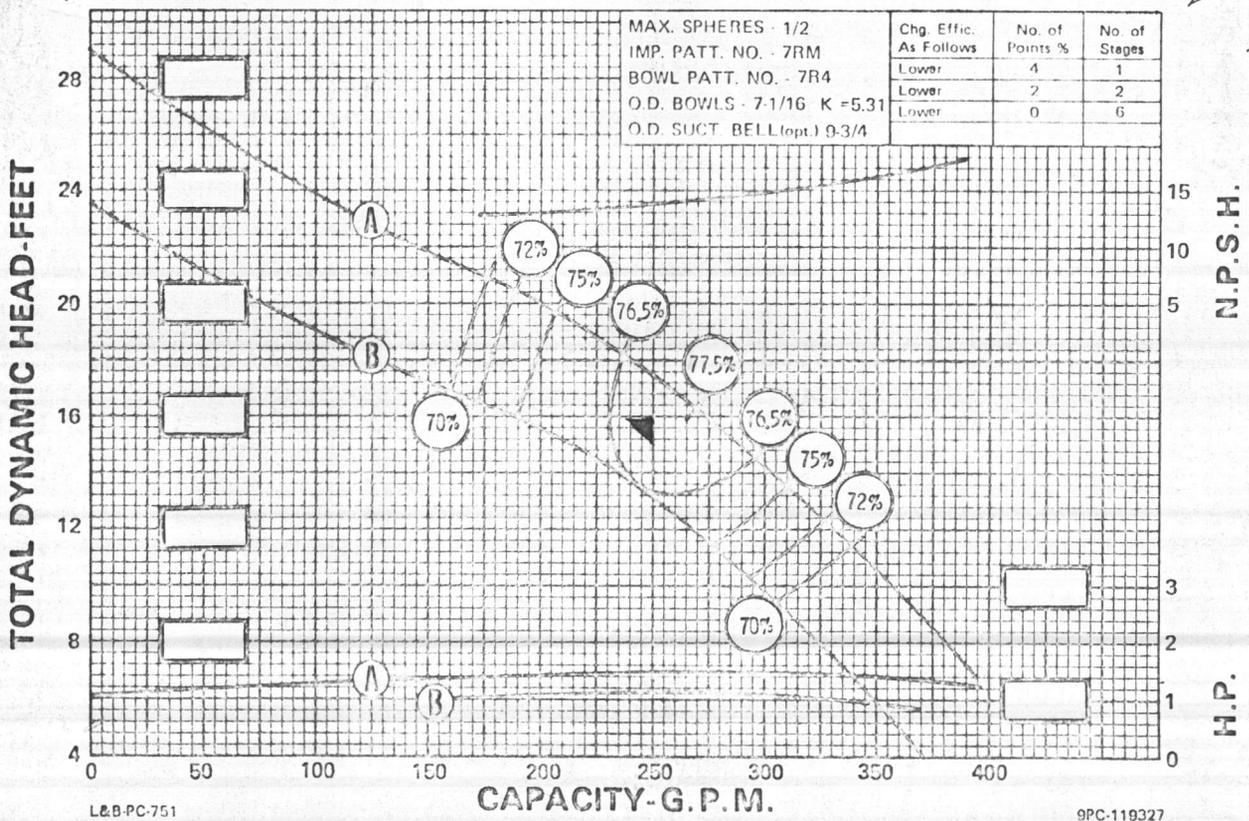


N.P.S.H.

H.P.



TC-325



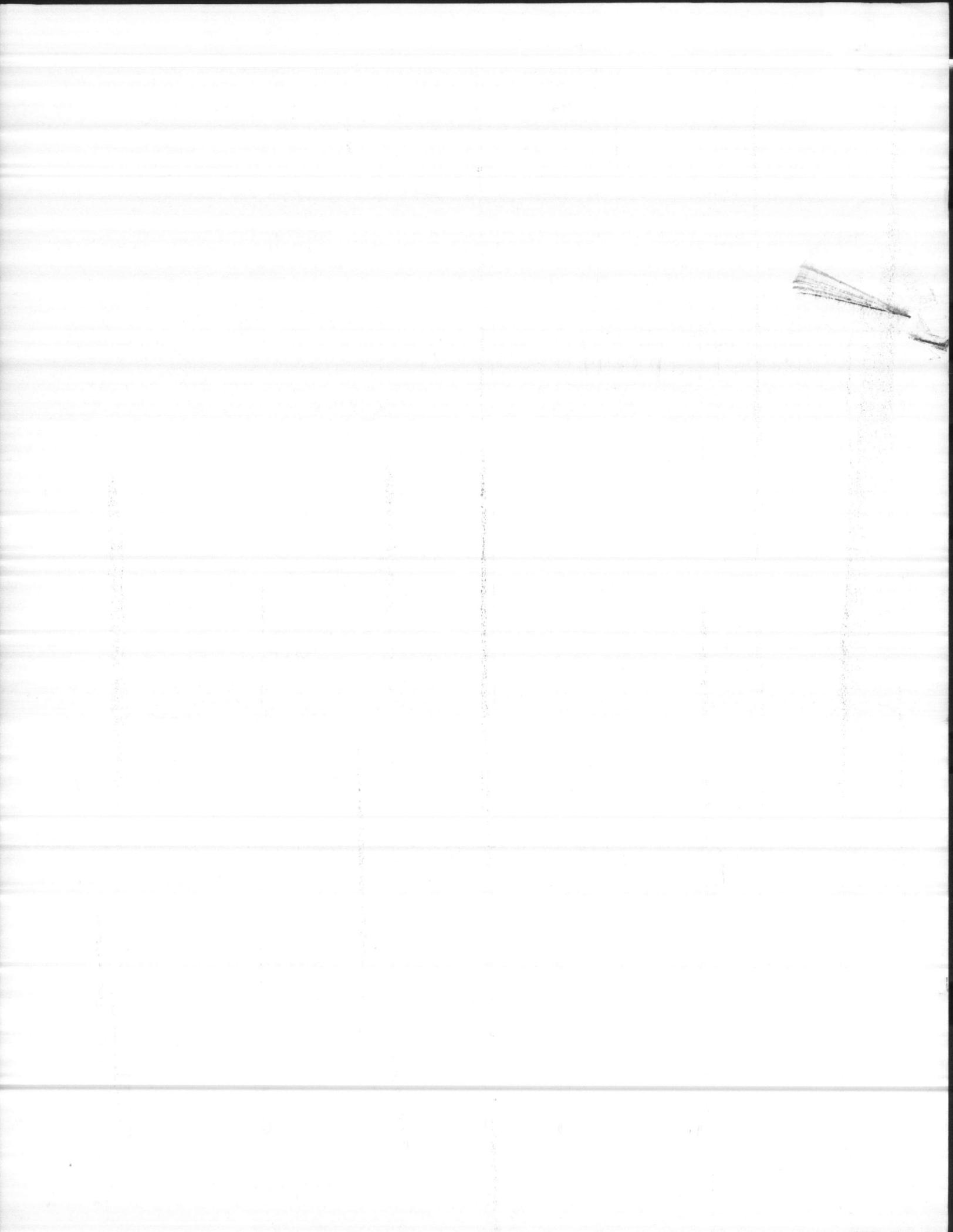
N.P.S.H.

H.P.



AURORA PUMP
A UNIT OF GENERAL SIGNAL
300 AIRPORT ROAD • NORTH AURORA, ILLINOIS • 60542

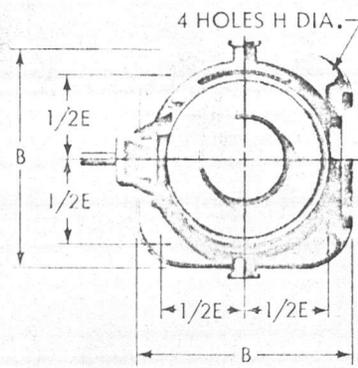
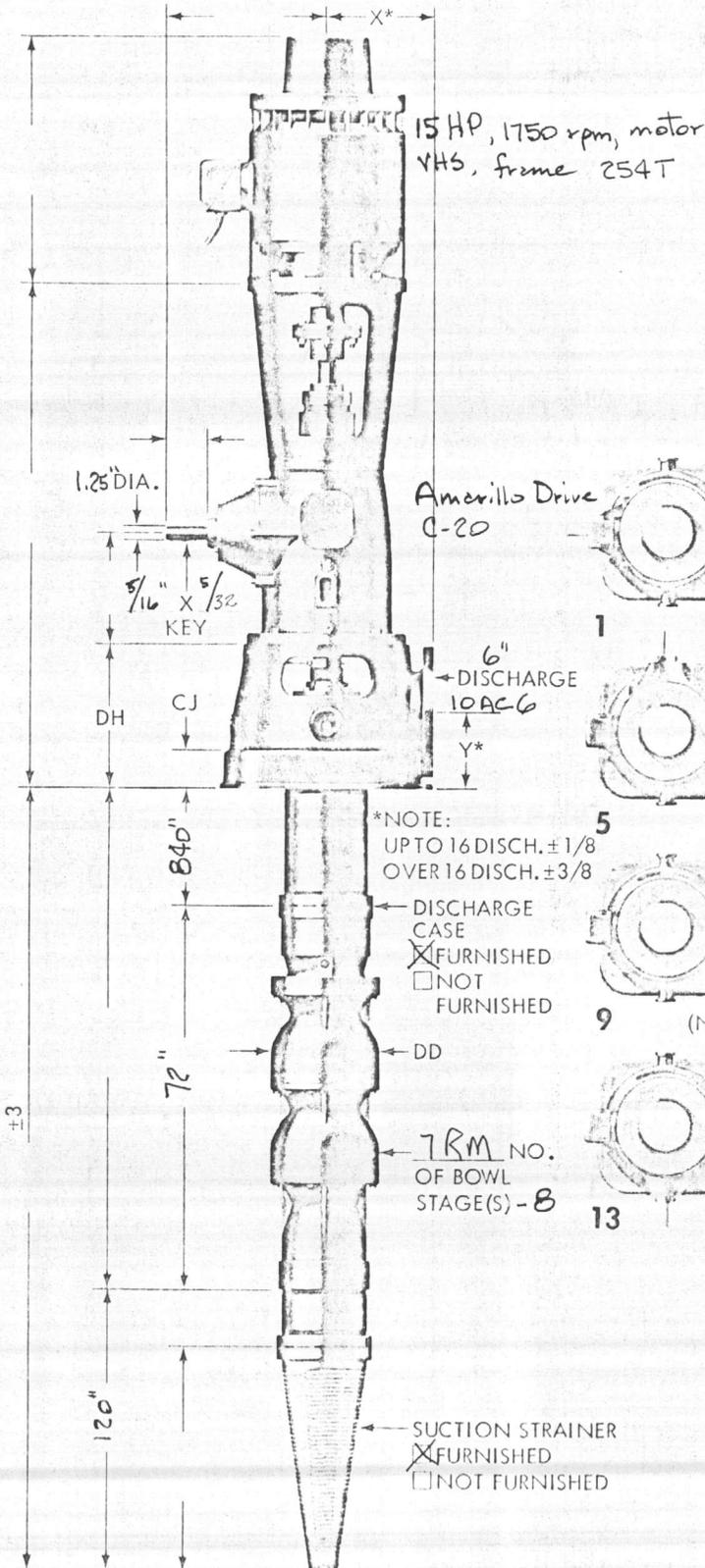
NUMBER OF STAGES REQUIRED FOR APPLICATION. STANDARD CURVE ILLUSTRATES SINGLE STAGE PERFORMANCE ONLY.



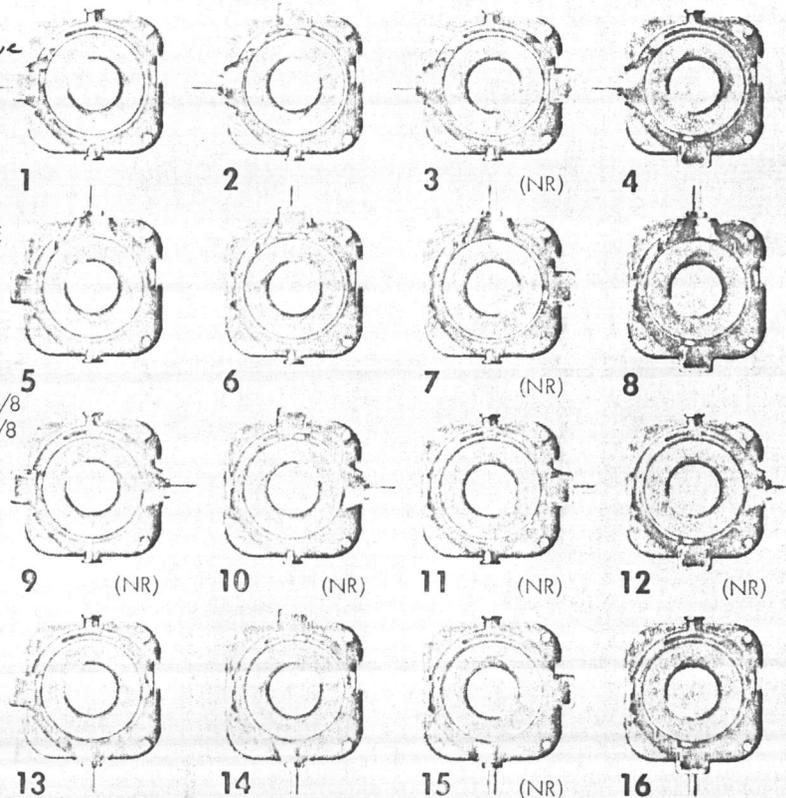
AURORA 1130 SERIES PUMPS

COMBINATION RIGHT ANGLE GEAR DRIVE CAST ABOVE SURFACE "AC & R" DISCHARGE HEAD — CONE S. RAINER

TT-25
655



ALTERNATE CONDUIT BOX
AND DRIVE SHAFT POSITIONS

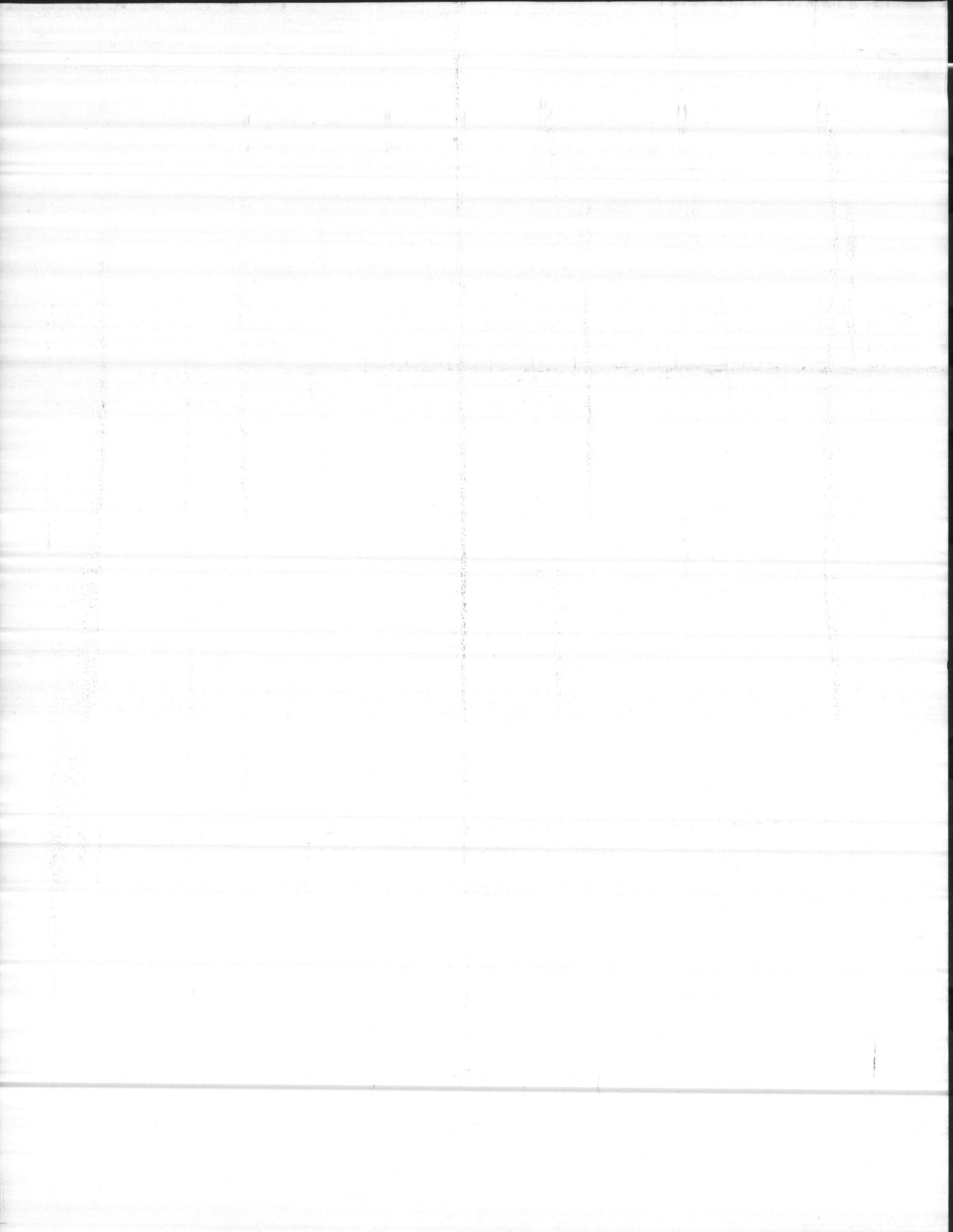


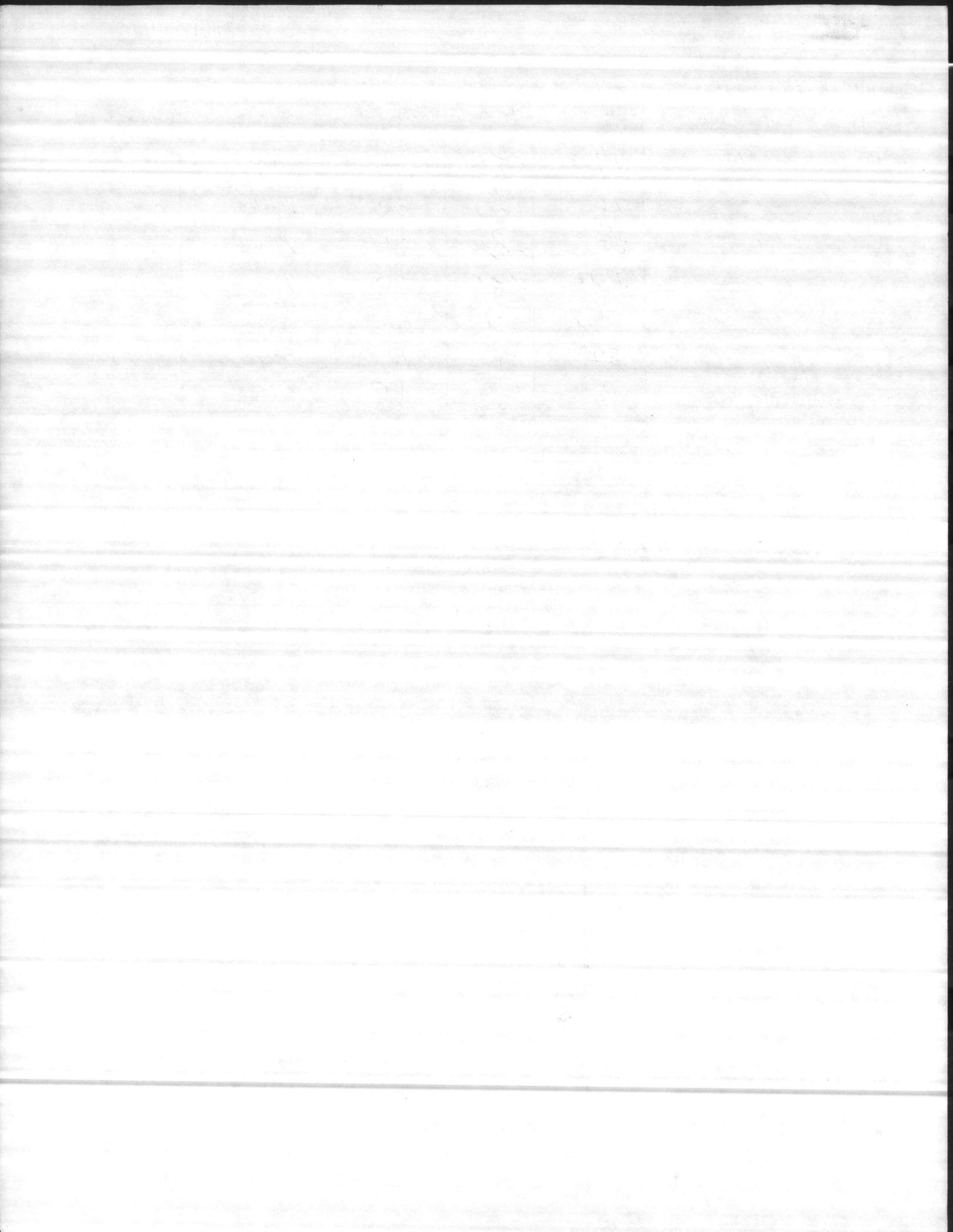
NOTES:

1. All dimensions in inches.
2. Component dimensions may vary ± 1/8.
3. Not for construction purposes unless certified.
4. Conduit box is shown in approximate location. Dimensions are not specified as they vary with each motor manufacturer.
5. Motor and gear drive to be mounted by others.
6. Discharge flange is American Standard flat face 125# ANSI, Bolt holes - strad. vert. ϕ .
7. Ideal universal joint operating angle is 1° to 5°.
8. NA not applicable.
9. NR not recommended.



AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD, NORTH AURORA, ILLINOIS 60542





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, 1968

1. AGENCY CODE MC	2. TYPE Q	3. LATITUDE ° 34 ' 44 " 9 N	4. LONGITUDE ° 77 ' 28 " 4 W	5.
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6. AGENCY STATION NO. TC504	7. STATION NAME TC508-J
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8. DRAINAGE BASIN CODE No. 6 Letter N	9. STATE CODE 32	10. COUNTY CODE 133	11. COUNTY NAME ONslow
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12. PERIOD OF RECORD Began 1957 Discontinued	Y <input type="checkbox"/> Continuous Interruption Exceeds 1 Year	13.	14.
---	---	-----	-----

15. SITE	<input type="checkbox"/> 101 Stream	<input type="checkbox"/> 102 Canal	<input type="checkbox"/> 103 Lake	<input type="checkbox"/> 104 Reservoir	<input type="checkbox"/> 105 Estuary	<input type="checkbox"/> 106 Spring	<input checked="" type="checkbox"/> 107 Well	<input type="checkbox"/> 110 Other
----------	-------------------------------------	------------------------------------	-----------------------------------	--	--------------------------------------	-------------------------------------	--	------------------------------------

16. FREQUENCY OF MEASUREMENT	<input type="checkbox"/> 201 Continuous Recorder	<input type="checkbox"/> 202 Telemetered	<input type="checkbox"/> 203 Daily	<input type="checkbox"/> 204 Weekly	<input type="checkbox"/> 205 Monthly	<input type="checkbox"/> 206 Quarterly	<input type="checkbox"/> 207 Seasonal	<input type="checkbox"/> 208 Annual	<input type="checkbox"/> 209 Other Periodic	<input checked="" type="checkbox"/> 210 Occasional
------------------------------	--	--	------------------------------------	-------------------------------------	--------------------------------------	--	---------------------------------------	-------------------------------------	---	--

17. TYPES OF DATA AVAILABLE	<i>Physical</i> <input type="checkbox"/> 311 Temperature <input type="checkbox"/> 312 Specific Conductance <input type="checkbox"/> 313 Turbidity <input type="checkbox"/> 314 Color <input type="checkbox"/> 315 Odor <input type="checkbox"/> 316 Radioactivity <input type="checkbox"/> 317 pH (field) <input checked="" type="checkbox"/> 318 pH (lab) <input type="checkbox"/> 319 Eh <input type="checkbox"/> 320 Other	<i>Chemical</i> <input type="checkbox"/> 331 Dissolved solids <input checked="" type="checkbox"/> 332 Chlorides Only <input type="checkbox"/> 333 Nutrients (Nitrogen and phosphorus compounds) <input type="checkbox"/> 334 Common ions <input checked="" type="checkbox"/> 335 Hardness <input type="checkbox"/> 336 Radiochemical <input type="checkbox"/> 337 Dissolved oxygen <input type="checkbox"/> 338 Other Gases <input type="checkbox"/> 339 Other	<i>Organic</i> <input type="checkbox"/> 351 Pesticides (insecticides, herbicides, etc.) <input type="checkbox"/> 352 Synthetic detergents <input type="checkbox"/> 353 Other <i>Biologic</i> <input type="checkbox"/> 361 Coliforms <input type="checkbox"/> 362 Other Micro-organisms <input type="checkbox"/> 363 BOD <input type="checkbox"/> 364 Other <i>Sediment</i> <input type="checkbox"/> 371 Concentration <input type="checkbox"/> 372 Particle size <input type="checkbox"/> 373 Other
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18. SUPPLEMENTARY DATA FOR SITE	<input type="checkbox"/> 421 Surface Water Station	<input type="checkbox"/> 422 Ground Water Station	<input type="checkbox"/> 423 Water Stage or Level	<input checked="" type="checkbox"/> 424 Water discharge	<input type="checkbox"/> 425 Time of Travel	<input type="checkbox"/> 426 Drainage Area
---------------------------------	--	---	---	---	---	--

19. STORAGE OF DATA	<input type="checkbox"/> 501 Periodic Report	<input type="checkbox"/> 502 Areal Report	<input checked="" type="checkbox"/> 503 Not Published	<input type="checkbox"/> 504 Data on Punchedcard	<input type="checkbox"/> 505 Data on Magnetic Tape	<input type="checkbox"/> 506 Other
---------------------	--	---	---	--	--	------------------------------------

20. OFFICE AT WHICH DATA AVAILABLE	Office <u>BASE MAINTENANCE DEPARTMENT.</u>
Street No. <u>MARINE CORPS BASE</u>	City, State, Zip <u>CAMP LEJEUNE, N. C. 28542</u>
City Code	<u>0735</u>

21. OFFICE COMPLETING FORM	<u>BASE MAINTENANCE DEPARTMENT</u>
----------------------------	------------------------------------

22. COMPILER'S NAME	23. DATE Month Year 19 66
---------------------	---------------------------------

