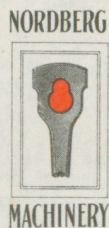


Adams Township, MI



NORDBERG MANUFACTURING CO.

DIESEL ENGINES - STEAM ENGINES - COMPRESSORS
SYMONS CRUSHERS - VIBRATING SCREENS - MINE HOISTS
TRACK MAINTENANCE MACHINERY - SPECIAL MACHINERY

Cable Address:
"NORDBERG MILWAUKEE"
Milwaukee Telephone
SHERIDAN 2370

REFER TO SUBJECT OR
INDIVIDUAL WRITING

GENERAL OFFICE & WORKS
MILWAUKEE, WIS. U.S.A.
July 29, 1942

ADDRESS ALL COMMUNICATIONS
TO THE COMPANY.

Copper Range Company
Painesdale
Michigan

ATTENTION: Mr. John J. Vitton

Dear Mr. Vitton:

At the request of our Mr. Larson, who called on you a few days ago, we are inclosing the following prints and data:

5-GA-17	General Drawing of 5-1/2' Standard Cone Crusher
5-GA-21	General Drawing of 5-1/2' Short Head Cone Crusher
F5-B-5	Foundation Drawing for 5-1/2' Standard Cone Crusher
F5-B-29	Foundation Drawing for 5-1/2' Short Head Cone Crusher
SKB-94	Piping Layout for Independent Motor Drive Pump
SK4-9	Clearance Dimension Blueprint
SKD-59	Weight Data Sheet
SK7-143	Diagramatic Layout of Piping Arrangement for Water Seal Socket on Symons Cone Crushers
SK7-142	Diagramatic Layout of Piping Arrangement for Water Seal Socket in connection with Settling Tank and Circulating Pump on Symons Cone Crushers
	Data on Safety Controls for Independent Pumps on Symons Cone Crushers.

Referring to the foundation prints, you will note that these show a texrope drive. Obviously, we cannot insert the dimensions covering the drive until we know the make and speed of the motor. Under date of April 2nd we wrote and quoted Mr. Schacht on the 5-1/2' Crushers and texrope drives and if you will refer to this letter, you will be able to obtain the specifications covering the sheaves for the three different motor speeds.

Referring to print SKB-94, this shows the piping layout with an independent motor driven pump.

Adams Township, MI

NORDBERG MANUFACTURING CO.

SHEET NO.

2.

DATE

July 29, 1942

Copper Range Co.
Painesdale
Michigan

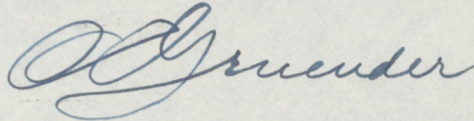
Referring to Prints SK7-142 and SK7-143, these show the piping arrangement for the water seal type socket. Print SK7-142 shows a settling tank and circulating pump in the event water is a scarcity and you wish to recirculate it through the socket. In most mining installations, water is not a problem especially in view of the fact that only 8 to 10 gallons per minute are required for each crusher.

The water seal type socket is recommended for dusty conditions such as you would have to contend with at White Pines.

We trust that the inclosed prints and data will serve your purpose. It will be a pleasure to hear from you if you require any additional information or if we can be of any further assistance.

Yours very truly,

NORDBERG MANUFACTURING COMPANY

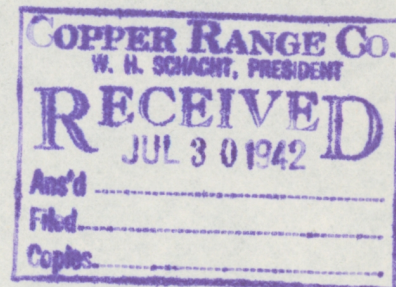


General Manager Crusher Division

OCGruender:JK

INCLS. prints & data

CC Mr. Larson



SAFETY CONTROLS
FOR
INDEPENDENT PUMPS ON SYMONS CONE CRUSHERS

The use of the independent motor-driven pump on Cone Crushers in preference to the built-in, or integral pump, necessitates the use of some device to protect the crusher in the event of oil pressure failure. This can be accomplished in several ways, the extent of which is largely determined by the nature of the other equipment in conjunction with the crusher.

Since each crusher is furnished with an oil pump and motor suitably mounted on a base, it is then necessary to determine the degree with which the control is to be carried out. Three (3) alternatives are suggested, each one operating in conjunction with a pressure regulator which is furnished with the aforementioned motor-driven pump.

ALTERNATE 1: Plain Electrical Interlock Between Oil Pump Motor and Crusher Motor.

This equipment is illustrated diagrammatically on print SKB-27 attached, and includes a pressure regulator and a magnetic motor starter for the oil pump having a special interlock.

If it is connected according to this diagram it operates so that in the event of pressure failing in the oil pump for any reason whatever, the oil pump automatically stops and at the same instant its electrical interlock breaks the circuit to the low voltage release coil on the large crusher motor, causing the crusher motor to stop also. The pressure regulator can be adjusted for any pressure between zero and fifteen pounds and is so interlocked that the oil pump must be in operation and the oil pressure up before the crusher motor can be started.

Since the crusher operates at an oil pressure of from 10-20#, it is advisable to set the pressure regulator at the low point, say 5-10# depending on the location of the pump with respect to the crusher, below which pressure the crusher cannot operate electrically.

It is to be noted that under this arrangement the crusher will shut down, filled with material, and would have to be freed before it can be started again.

The equipment for this arrangement is as follows:

Pressure Regulator -- Furnished by Nordberg Mfg. Company.
Starter for Oil Pump Motor -- Furnished by Purchaser.

ALTERNATE 2: Time Delay Signal and Electrical Interlock Between Oil Pump and Crusher Motor.

This equipment is shown diagrammatically on drawing SKD-28, attached, and includes a pressure regulator starter for the oil pump, having a special interlock as well as a time delay relay.

If it is connected according to this diagram, it operates so that in the event of oil pressure failure for any reason whatever, the oil pump automatically stops and a signal is excited either by lights or siren, giving the operator a warning that oil pressure has failed. The crusher motor is allowed to operate, however, for an adjustable period of time, say 3-5 minutes, before its control circuit is interrupted. If, after that interval of time the oil pressure has not been restored, the interlock on the time delay relay will open, thereby stopping the crusher motor.

The principal difference between this arrangement and Alternate #1 is that it permits a short interval of time during which time the operator can restore the pressure by making a quick repair, or valving, or he will be able to shut off the feed to the crusher manually, permitting the machine to clear itself before it is shut down.

This equipment includes the following:

- Pressure Regulator -- Furnished by Nordberg Mfg. Co.
- Starter for Oil Pump Motor -- Furnished by Customer.
- Enclosed Time Delay Relay incorporating Signal and Arranged to Stop Feeder Motor -- Furnished by Customer.

ALTERNATE 3: Time Delay Relay Incorporating Signal and also Arranged to Stop Feeder Motor.

This control is shown diagrammatically on drawing SKD-29, attached. The two terminals in the time delay relay would be connected in series with the main contactor coil of the feeder motor starter.

If it is connected according to the above diagram, the operation would be as follows: Upon starting, the oil pump must first be started and will maintain as soon as the oil pressure has reached the desired value. After this the crusher motor and feeder motor can be started.

Upon oil pressure failure for any reason whatever, the oil pump motor stops first, immediately sounding the signal and stopping the feeder motor. The crusher, however, is permitted to run for an

adjustable period of time after the feeder has been shut down, permitting it to clear itself. The signal continues to sound, however, until the crusher motor has been stopped.

This equipment includes:

Pressure Regulator -- Furnished by Nordberg Mfg. Co.

Starter for Oil Pump Motor -- Furnished by Customer

Time Delay Relay with Additional Interlock for Feeder Motor Starter-
Furnished by Customer.

Signal Light or Siren -- Furnished by Customer.

IT IS OF UTMOST IMPORTANCE THAT WE BE FURNISHED THE CURRENT
CHARACTERISTICS OF THE AVAILABLE POWER IN ORDER THAT THE PROPER OIL
PUMP MOTOR AND PRESSURE REGULATOR CAN BE SUPPLIED.

HMZ/hm

INSTALLATION INSTRUCTIONS

TYPES DA-21 AND DA-31 MERCOID PRESSURE CONTROLS

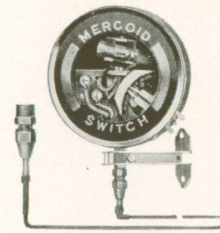
PATENTS ISSUED: 1,521,638, 1,598,874, 1,640,869, 1,757,436, 1,734,015, 1,734,016, 1,949,915, 1,991,350, 2,018,310, 2,043,441, OTHERS PENDING



TYPE DA-21 OR DA-31



PIG TAIL
STEAM SIPHON



TYPE DA-21 OR DA-31
SHOWING MOUNTING BRACKET P.P.-33-25
AND REMOTE CONNECTION P.P.-49-82

Type DA-31 controls are designed for use on steam where pressures change slowly, and are furnished standard with a steam siphon.

Type DA-21 controls are designed for applications where pressures fluctuate, such as in connection with pumps or compressors, or where instruments are subject to surges or water hammer.

These instruments are provided with heavy gauge bourdon tubes, and are equipped with a check valve in the socket to dampen out surges or pulsations.

MOUNTING

ALL PRESSURE CONTROLS MUST BE MOUNTED IN VERTICAL POSITION. Control must not be mounted by twisting the case. Use a wrench on square part of connection.

All Type DA-31 steam controls must be siphoned to prevent live steam entering the bourdon tube. Use pigtail siphon illustrated above which is furnished with each instrument or ball type siphon if present on boiler. On high pressures steam in excess of 100 pounds mounting bracket and remote connection, as illustrated above, should be used. By mounting remote, the control is removed from the extremely high boiler temperatures, and the remote connection acts as a siphon to protect the control.

On applications where vibration is excessive, remote connections (see illustration above) should be made to Type DA-21 controls. If mounted direct the continual vibration will cause excessive wear of movement parts and shorten the controls life.

If pressures fluctuate over wide limits or water hammer is present, Type DA-21 instruments must be installed on a surge tank to insure satisfactory operation.

WIRING

RIGID CONDUIT MUST NOT BE ATTACHED DIRECTLY TO INSTRUMENT. Use a short strip of BX to relieve control of conduit expansion and contraction strains.

When fitting BX cable connector into case, be careful not to strike or injure either the Bourdon tubing or instrument mechanism.

The lead wires should be cut short and directly connected to the terminal posts.

Excessive lengths of wire crowded into the case interfere with the free movement of the Bourdon tube or mechanism and cause erratic operation.

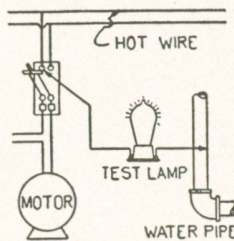


ILLUSTRATION NO. 1

Where control is directly connected into load circuit it must be connected in hot side of line. If in doubt as to which is the hot wire, connect one wire of a test lamp to a water pipe, or some other suitable ground. The lamp will light when the other wire (of test lamp) is connected to the hot wire. See illustration No. 1.

Fuses installed in line switch should not exceed rating shown on control nameplate.

ADJUSTMENTS

The Type DA-21 and DA-31 MERCOID Pressure Control may easily be adjusted to the desired operating points by means of the outside adjustment screws "C" and "D" (see illustration No. 2). The pointers over the calibrated dial indicate the pressures at which the instrument is set to operate. Do not attempt to force this instrument to operate at less than minimum differential as shown on name plate. Never exceed maximum pressure rating.

These instruments are calibrated and tested at the factory against accurate master gauges and unflinchingly operate at the pressures indicated by the pointers.

Small pressure gauges such as are generally employed on steam boilers are seldom accurate. Do not attempt to reset control dial should there be a difference between the point at which the control operates and the pressure gauge reading. If the difference is appreciable the steam gauge should be recalibrated and tested for accuracy at its normal working pressure.

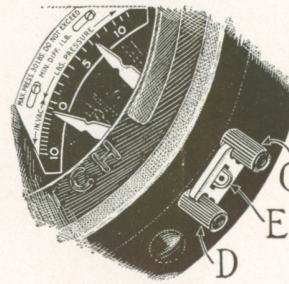


ILLUSTRATION NO. 2

LOCKING DEVICE

All Type DA-21 or DA-31 controls are regularly furnished with an adjusting screw locking bar. (See illustration No. 3.) When the control has been adjusted to the desired operating pressures, the locking bar may be inserted between the adjustment screws "C" and "D" with slot "A" passing over the projecting lug "E". Points "B" engage with the knurled adjustment screws and prevent changing the adjustment. By placing a sealing wire between the locking bar, and the hole in the lug "E" the adjustments of this instrument cannot be tampered with.

CAUTION: Be sure to remove locking bar when attempting any adjustments.

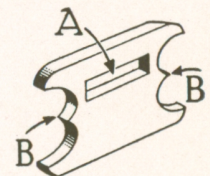


ILLUSTRATION NO. 3

CAUTIONS

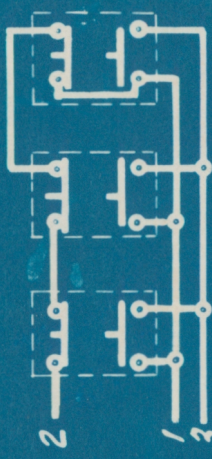
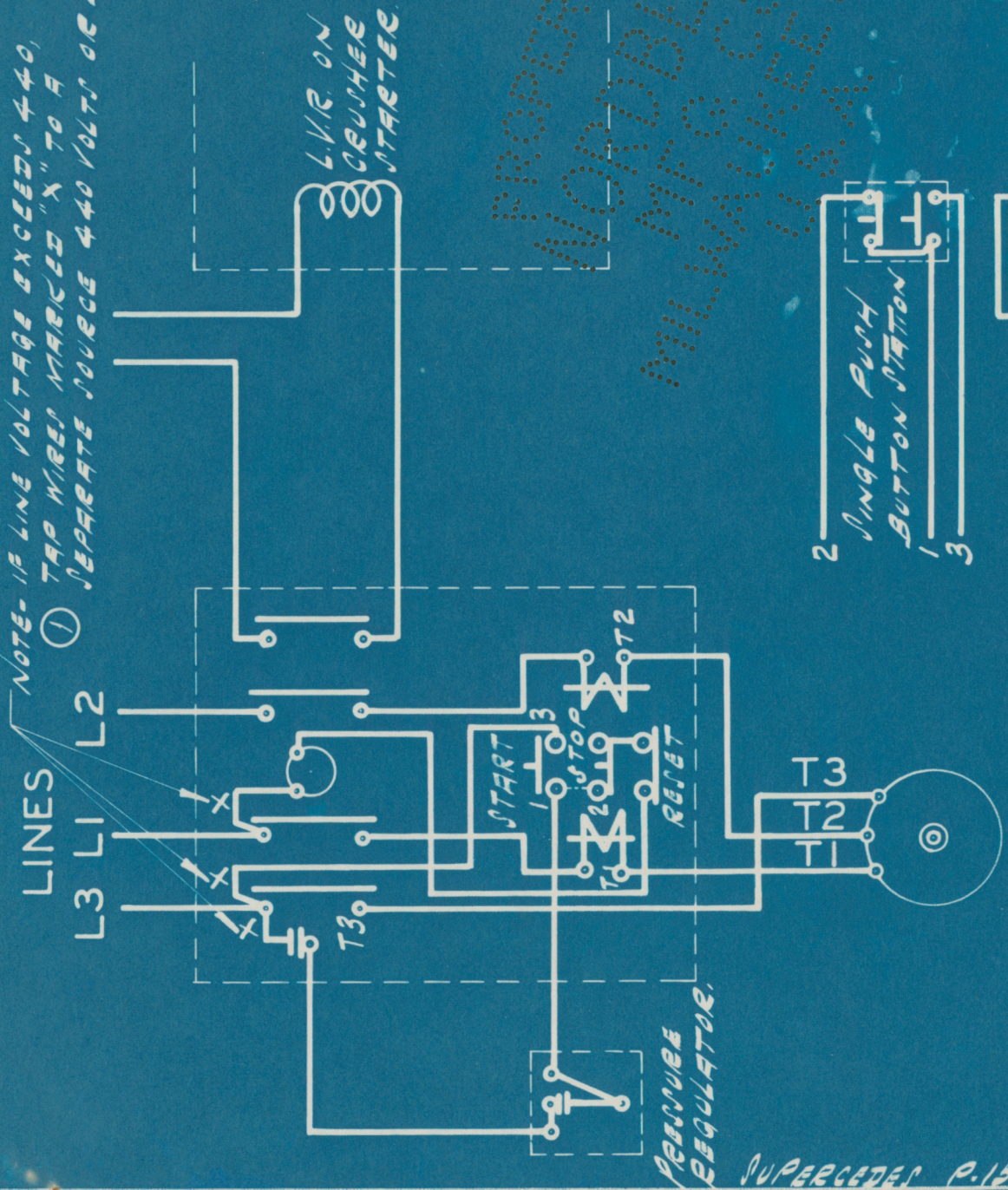
When testing a boiler or system, never exceed maximum pressure rating on control or it may be seriously damaged. Remove control if higher pressures are required.

DO NOT FAIL TO USE A SIPHON ON STEAM.
DO NOT OIL ANY CONTROL PARTS.

THE MERCROID CORPORATION

4201 BELMONT AVE.
CHICAGO, ILLINOIS

NOTE - IF LINE VOLTAGE EXCEEDS 440,
 TAP WIRES MARKED "X" TO A
 SEPARATE SOURCE 440 VOLTS OR LESS.



WHEN REMOTE CONTROL
 PILOT DEVICE IS USED
 REMOVE CONNECTOR 1-2
 FROM PANEL.

OIL PUMP MOTOR.

SUPERCEDES P.158

A	11-22-37.	B	3-10-39.
ISSUED		① NOTE ADDED	

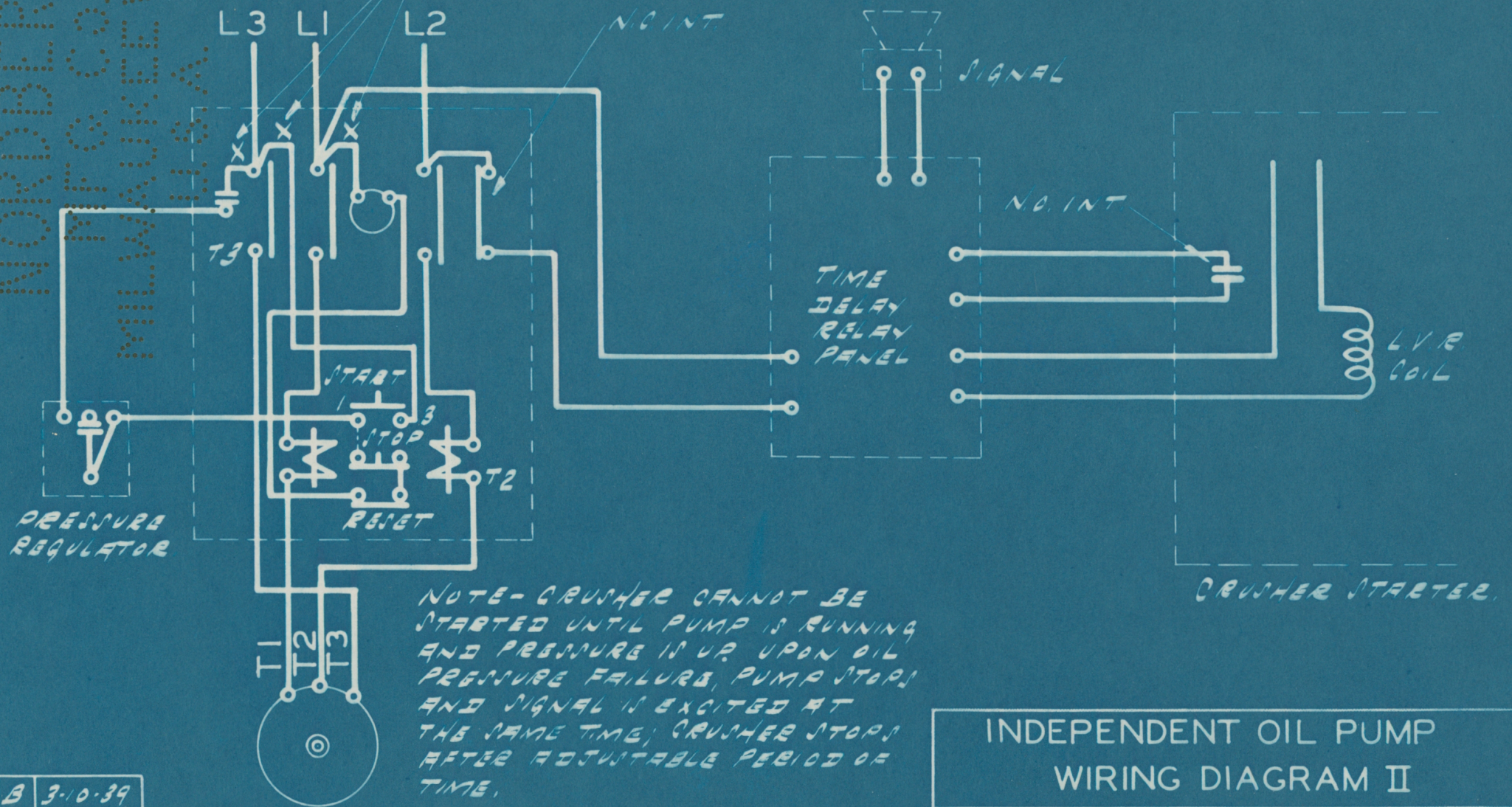
**INDEPENDENT OIL PUMP
 WIRING DIAGRAM I**

NORDBERG MFG. CO., MILWAUKEE, WIS.

DRAWN <i>J. J. O.</i>	SCALE <i>—</i>
TRACED <i>12-23-41 C.H.</i>	DATE <i>11-22-37</i>
CHECKED	SKD-27

NOTE - CRUSHER CANNOT BE STARTED
 UNTIL PUMP IS RUNNING AND
 PRESSURE IS UP.
 IF OIL PRESSURE SHOULD FAIL
 BOTH STOP AT THE SAME TIME.

① NOTE - IF LINE VOLTAGE EXCEEDS 440, TAP WIRES MARKED "X" TO A SEPARATE SOURCE 440 VOLTS OR LESS.



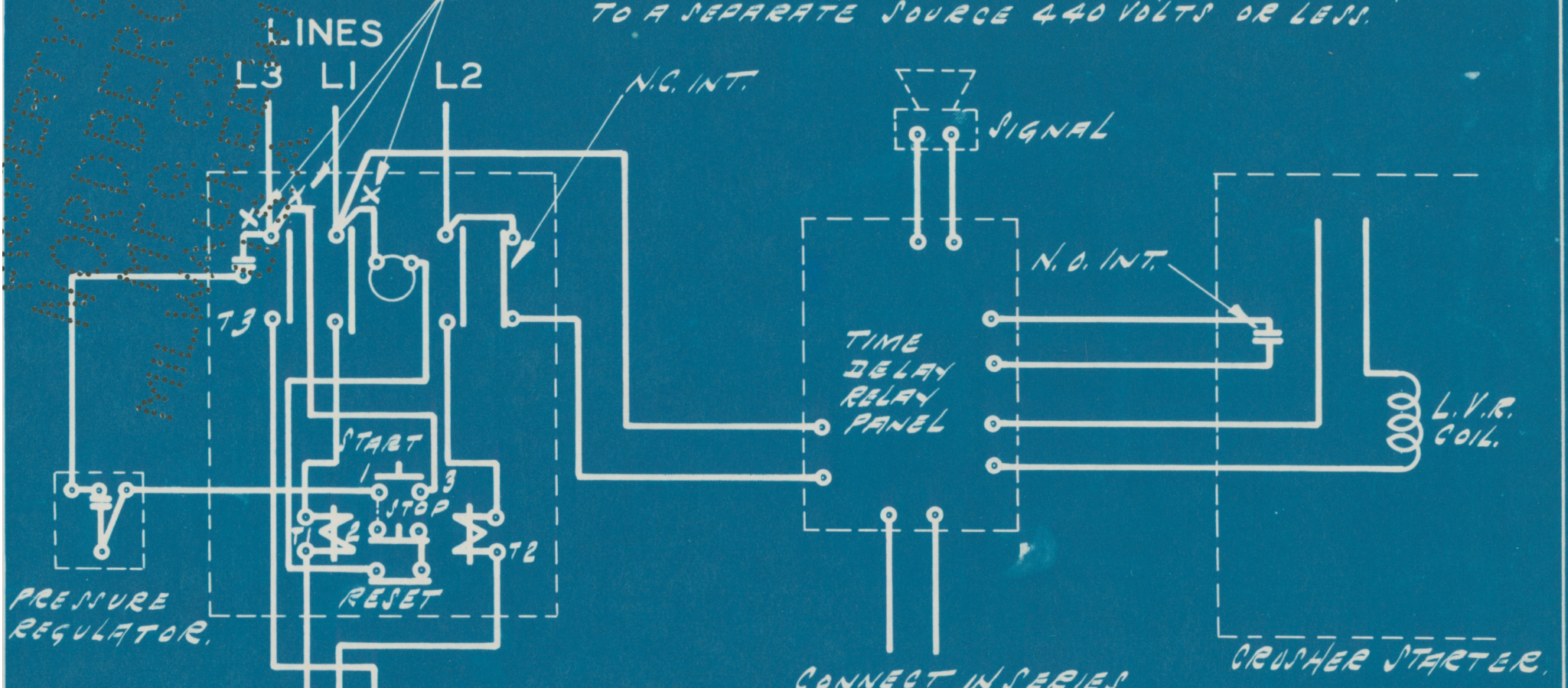
NOTE - CRUSHER CANNOT BE STARTED UNTIL PUMP IS RUNNING AND PRESSURE IS UP. UPON OIL PRESSURE FAILURE, PUMP STOPS AND SIGNAL IS EXCITED AT THE SAME TIME; CRUSHER STOPS AFTER ADJUSTABLE PERIOD OF TIME.

B	3-10-39
①	NOTE ADDED
A	11-22-37
	ISSUED

OIL PUMP MOTOR

INDEPENDENT OIL PUMP WIRING DIAGRAM II	
NORDBERG MFG. CO., MILWAUKEE, WIS.	
DRAWN	J. J. O
TRACED	12-30-41 C.H.
CHECKED	
SCALE	—
DATE	11-22-37
SKD-28	

① NOTE - IF LINE VOLTAGE EXCEEDS 440, TAP WIRES MARKED "X" TO A SEPARATE SOURCE 440 VOLTS OR LESS.



PRESSURE REGULATOR.

CRUSHER STARTER.

CONNECT IN SERIES WITH MAIN COIL OF FEEDER MAGNETIC STARTER.

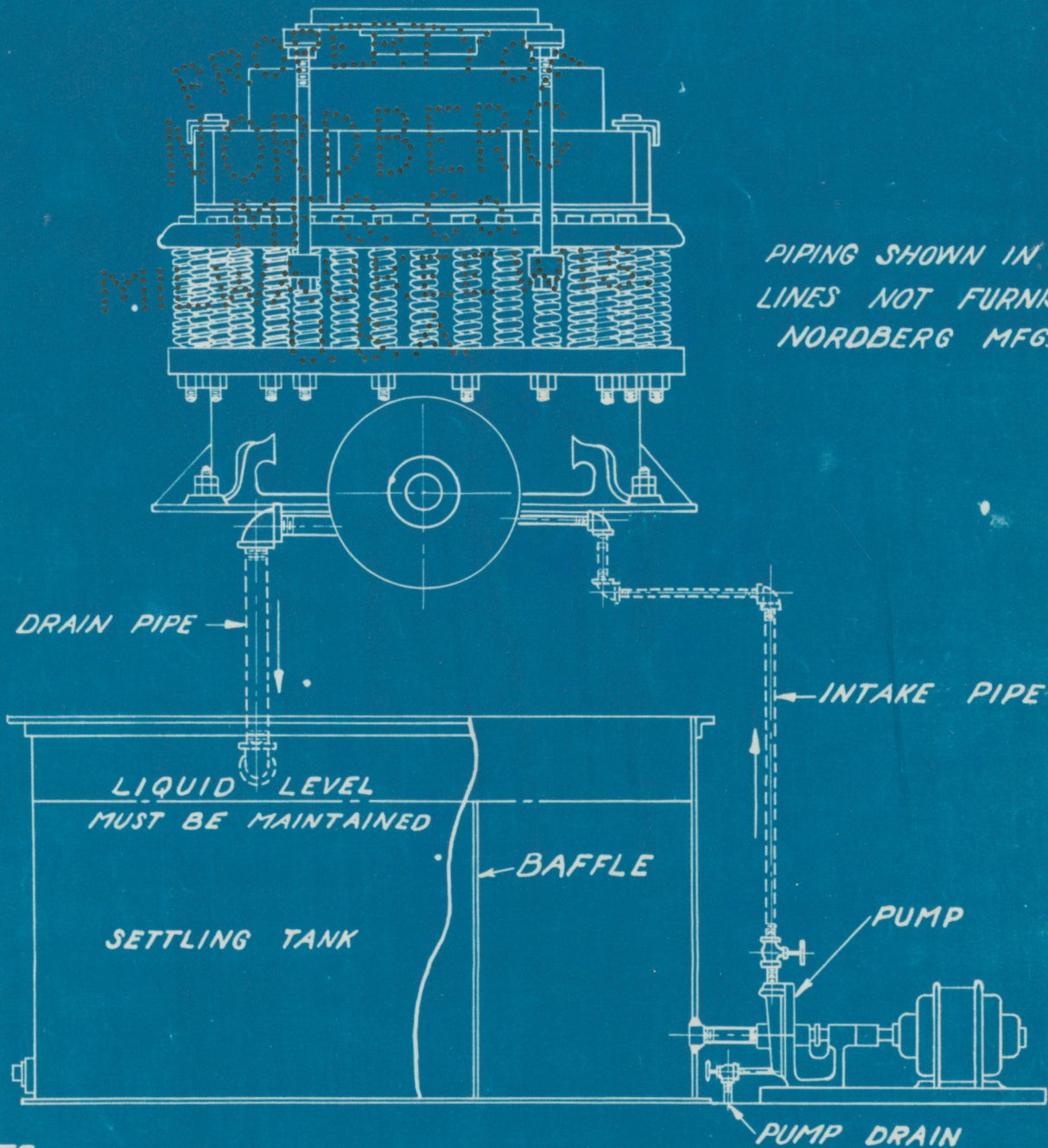
NOTE - CRUSHER & FEEDER MOTORS CANNOT BE STARTED UNTIL PUMP IS RUNNING & PRESSURE IS UP. UPON OIL PRESSURE FAILURE, PUMP & FEEDER MOTORS ARE STOPPED, AND SIGNAL EXCITED; CRUSHER STOPS AFTER AN ADJUSTABLE PERIOD OF TIME.

OIL PUMP MOTOR.

B	3-10-39.
①	NOTE ADDED
A	11-22-37.
	ISSUED

INDEPENDENT OIL PUMP WIRING DIAGRAM III	
NORDBERG MFG. CO., MILWAUKEE, WIS.	
DRAWN <i>J. J. O.</i>	SCALE <i>—</i>
TRACED <i>12-29-41/G.H.</i>	DATE <i>11-22-37.</i>
CHECKED	SKD-29

ARRANGEMENT OF WATER SEAL PIPING
WHEN PUMP AND SETTLING TANK IS USED



PIPING SHOWN IN DOTTED
LINES NOT FURNISHED BY
NORDBERG MFG. CO.

NOTE:- FOR COLD WEATHER OPERATION USE
AN ANTI-FREEZE OR CRUDE OIL.

SIZE CRUSHER	DRAIN PIPE	INTAKE PIPE	GALLONS LIQUID REQ'D	G. P. M. PUMPED	H. P. PUMP MOTOR
2 FT.	3/4	3/4	300	2-3	1/2
3 FT.	1	3/4	300	3-4	1/2
4 FT.	1 1/2	1	500	5-7	1/2
5 1/2 FT.	1 1/2	1	500	8-10	1
7 FT.	1 1/2	1	500	10-12	1

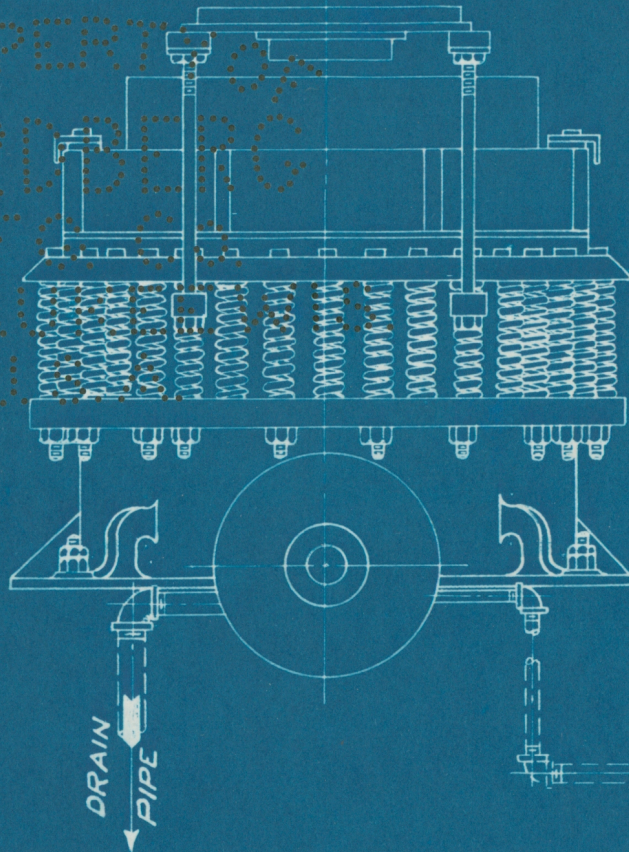
DIAGRAMATIC LAYOUT OF
PIPING ARRANGEMENT FOR
WATER SEAL SOCKET ON
SYMONS CONE CRUSHERS

NORDBERG MFG. CO.

MILWAUKEE, WIS., U.S. A.

SK 7-142

ARRANGEMENT OF WATER SEAL PIPING WHEN
SUPPLY IS TAKEN FROM PLANT SYSTEM



PIPING SHOWN IN
DOTTED LINES NOT
FURNISHED BY
NORDBERG MFG. CO.

GATE VALVE- USE TO
REGULATE QUANTITY OF
WATER

GATE VALVE TO DRAIN SOCKET
WHEN CRUSHER IS SHUT DOWN
CLOSE WHEN IN OPERATION

GATE VALVES FURNISHED
BY NORDBERG MFG. CO.

SIZE CRUSHER	DRAIN PIPE	SUPPLY PIPE	G.P.M. FLOW
2 FT.	3/4	3/4	2-3
3 FT.	1	3/4	3-4
4 FT.	1 1/2	1	5-7
5 1/2 FT.	1 1/2	1	8-10
7 FT.	1 1/2	1	10-12

DIAGRAMATIC LAYOUT OF
PIPING ARRANGEMENT FOR
WATER SEAL SOCKET ON
SYMONS CONE CRUSHERS

NORDBERG MFG. CO.
MILWAUKEE, WIS., U.S.A.

SK7-143

STANDARD CONE CRUSHER DATA

6-11-42

SIZE	CRUSHER WEIGHT COMPLETE	WGT. OF MAIN FRAME, SPRINGS & CTR. SHAFT BOX ASSEMBLY COMPLETE	WGT. OF HEAD SHAFT MANTLE ETC. ASSEMBLY COMPLETE	WGT. OF BOWL ADJ. CAP & BOWL LINER COMPLETE	WGT. OF MANG. MANTLE	WGT. OF MANG. FINE BOWL LINER	WGT. OF MANG. COARSE BOWL LINER	COUNTER SHAFT ASSEMBLY	OIL (APPR.) REQUIRED IN CIRC. SYSTEM	REQUIRED ZINC COMPOUND IN LBS.
20"	7,700	3,780	900	1,280	210	200	200	900	50	M 30 L 30
2 FT	10,000	5,500	1,400	1,500	230	260	256	1,525	50	M 60 L 50
3 FT	21,000	10,700	2,900	4,300	735	800	700	2,150	100	M 160 L 115
4 FT	35,000	16,750	5,600	8,350	1464	1835	1578	2,600	100	M 310 L 250
4 1/4 FT	45,000	22,000	8,900	7,550	1650	1940	2050	2,600	100	M 360 L 310
5 1/2 FT	83,000	35,000	15,200	17,250	4380	4275	4450	3,600	160	M 800 L 875
7 FT	140,000	52,000	28,500	26,000	FINE 7025 COARSE 6640	6540	6960	5,600	160	M 1200 L 1200

SHORT HEAD CONE CRUSHER DATA

2 FT	10,300	5,925	1,600	1,625	265	325	290	1,525	50	M 50 L 50
3 FT	21,500	10,700	3,700	3,600	625	730	810	2,150	100	M 80 L 100
4 FT	44,000	22,000	8,400	7,350	1,512	1,713	1,700	2,600	100	M 150 L 235
5 1/2 FT	86,000	46,000	18,500	16,200	3,550	3,695	3,800	3,600	160	M 350 L 400
7 FT	150,000	65,500	34,000	23,500	6,299	7,105	7,515	5,600	160	M 900 L 1000

RECOMMENDED ZINC COMPOUND 90% VIRGIN ZINC & 10% LEAD.