

DIRECTIONS FOR OPERATING

**GRAND RAPIDS
HYDRAULIC FEED
SURFACE GRINDERS**



Manufactured by
GALLMEYER & LIVINGSTON CO.
GRAND RAPIDS, MICHIGAN

INSTRUCTIONS FOR SETTING UP AND OPERATING "GRAND RAPIDS"
 PRECISION TYPE HYDRAULIC FEED SURFACE GRINDERS
 MODELS NO. 25, 28, 35, 36, 38, 38A,
 45, 45A, 55, 55A, 65 and 65A.

MANUFACTURED BY
 GALLMEYER & LIVINGSTON COMPANY
 GRAND RAPIDS, MICHIGAN, U.S.A.

GENERAL

FOUNDATION A substantial foundation is essential to a surface grinder. A concrete block of ample depth, depending on soil conditions encountered, will enable the machine to produce the finest results. A steel plate placed under each of the three supporting screws will facilitate the leveling operation.

LEVELING Place a precision level on the chuck or table of the machine and adjust the leveling screws until machine is level both longitudinally and transversely. Holes are provided next to the leveling screw holes for lag screws.

STARTING THE MACHINE

ELECTRICAL CONNECTIONS Make certain that the electrical characteristics of the available power supply agree with the specifications stamped on the motor name plates of the machine. The machine is internally wired so that all motors will run in the right direction if one does. Momentarily start the grinding wheel spindle. If its direction agrees with the arrow on the wheel hood cover, all motors will run in the right direction. If not, change line wire connections.

HYDRAULIC OIL SUPPLY Check the oil level in the hydraulic system. A bayonet gauge, accessible through the base rear door, is clearly marked to indicate the level of oil required in the tank. Keep the oil level near the "F" mark on the gauge.

PRINCIPLE CONTROLS The table stop and start lever is located on the left hand side of the saddle. Movement to the right starts the table and to the left, stops the table.

The table speed control lever on the No. 25 and 28 is located on top of the saddle directly behind the table reverse pilot valve. On all other models, the speed control knob is on the right hand side of the saddle. Clockwise rotation of the control knob increases the table speed.

Cross feed is engaged by the lever behind and to the left of the cross feed hand wheel. The direction of cross feeding is determined by the movement of the cross feed engaging lever. Forward movement causes the saddle to move in, while the reverse feeds the saddle out. The amount of cross feed is governed by an adjustable link to the right of the cross feed hand wheel and under the apron of the saddle. The maximum cross feed is approximately one-eighth of an inch per reversal. *

It is good practice to start the table movement with the table reverse dogs close together. No serious damage is done, however, if the piston does occasionally strike the end of the cylinder. On

* See page 5.

larger sizes of machines (No. 45 thru 65A), tables are equipped with safety dogs. These dogs are designed so that the table cannot over-run them by power. The position of these safety dogs is adjustable and should be changed with variations of load, speed and temperature of the oil.

OPERATING THE MACHINE

TABLE SPEEDS It is recommended that the table be operated at approximately full speed for all ordinary grinding work. Tests have shown that light depths of cut with wide feeds and high table speeds will produce, in most cases, the finest work in the shortest time. Table reverse dogs should be set so as to allow the cross feeding to take place while the wheel is off the work. Inasmuch as table over-run varies with the temperature of the oil and the speed and mass of the work, it is good practice to reset the table reverse dogs whenever any of the above mentioned conditions are changed.

CROSS FEED LIMIT Cross feed limit stops are located on the left hand side of the machine. These stops are normally set to automatically stop the hydraulic mechanism at either end of the saddle movement. When reversing the saddle movement after the limit stop has functioned, it may be necessary to turn the cross feed hand wheel one or two turns to move the limit dogs off the contact point before the hydraulic system can be re-started. These limit dogs can be adjusted to narrower work, if desired.

The cross feed hand wheel is graduated in thousandths of an inch.

ELEVATING MECHANISM The large elevating hand wheel is used for coarse vertical adjustment of the spindle head. Graduations are in thousandths and are widely spaced. The small hand wheel inside the large hand wheel is graduated in tenths of a thousandth and the spacing between graduations is large enough to split if necessary.

HAND LONGITUDINAL TABLE MOVEMENT This feature is standard equipment on the No. 25, 28 and 35 (See optional equipment for other models.) When feeding the No. 25 or 28 table by hand, disconnect the table piston rod by loosening the knurled nut under the right hand table end guard. Engage the table movement by advancing the hand wheel until it meshes with the table rack. A spring plunger on the under side of the hand wheel shaft housing locks the shaft in its in or out position. When returning to hydraulic feed, do not tighten the piston rod nut more than finger tight.

MAINTENANCE

REPAIR PARTS When ordering repair parts, always state the model and serial number of the machine for which the parts are desired.

LUBRICATION See lubricating instructions enclosed.

HYDRAULIC SYSTEM Hydraulic oil should be changed at the end of the first thirty days service and once every six months of normal operation thereafter. Models other than the No. 25 and 28 can be pumped nearly empty by removing the pipe plug and opening the globe valve located on the delivery side of the hydraulic pump. Do this with the pump motor running and the table at rest. All models can be completely drained by removing a plug at the bottom edge of the oil

tank. This plug is located in the rear on Models No. 25 and 28, and in front on all other machines. Use a good grade of oil when refilling the hydraulic system. (See Lubrication Instructions).

The table reverse valve can be adjusted to provide any degree of table over-run desired. On the No. 25 and 28, this adjustment is accomplished by turning a small needle valve directly behind the saddle apron and to the right of the cross feed hand wheel. On all other models, two needle valves are available for this purpose. These valves are located on each side of the main valve casting underneath the saddle and towards the front of the machine. The corresponding pair of needle valves towards the rear of the machine controls the cross feed engine piston and normally require no adjustment beyond that made at the factory. Turning either of these table reverse needle valves clockwise increases the over-run of the table.

WARNING The above adjustments should be made slowly and with the table running on short stroke.

The relief valve for the hydraulic system is located next to the hydraulic pump and controls the maximum pressure the pump will develop in the system. To check the pressure setting of the valve, run the table slowly beyond the table dogs to either end of its movement and allow the stop and start valve to remain in the "on" position. The pressure gauge, which is located in the rear of the machine, can now be read. If the pressure indicates less than the figure indicated by a red dot on the gauge face, loosen the check nut on the square adjustment screw of the relief valve and turn this screw clockwise until the desired reading is obtained. If the gauge pressure is unusually low and no appreciable change can be effected through the adjusting screw, dirt has become lodged under the relief valve seat. This condition can usually be remedied by running the pump and backing the pressure adjusting screw out five or six turns and resetting to the desired pressure. This procedure allows a large volume of oil to wash any dirt accumulation off of the relief valve seat. The pressure gauge valve should be closed except when reading pressure, as hydraulic pressure variations of normal operation will ultimately destroy the gauge.

Relief valve pressures for various models are as follows:

MODEL NUMBER	PRESSURE, P.S.I.
No. 25	200
No. 28	275
No. 35, 36, 38, 38A	300
No. 45	325
No. 45A, 55, 55A, 65, 65A	350

Hydraulic Oil tank capacities are given in Lubricating Instructions enclosed.

GRINDING WHEELS Do not attempt to get the best results for various classes of work with one wheel. Working tests will prove which wheels are best suited to a particular job. Only perfectly balanced wheels will give the kind of results the rest of your machine has been designed to produce.

When specific problems regarding wheel selection are encountered, we strongly urge the user to contact the local representative of a wheel manufacturer.

SPINDLE Flanged, preloaded, precision ball bearings are used on all standard machines. When these bearings need replacing, order from the Gallmeyer & Livingston Company to insure receiving the correct size, type and precision. Detailed instructions and drawings are supplied with each set of replacement bearings.

Do not hammer on the spindle to remove the grinding wheel mount. A wheel mount puller is furnished to accomplish this operation without damaging the spindle or bearings.

SPINDLE SPEEDS Spindles are belt driven by two or more vee belts. On the No. 25 and 28, the pulleys contain extra grooves to which the belts may be shifted to provide a second spindle speed. Raising the spindle motor slightly decreases the center distance and allows the belts to be shifted from one pair of grooves to the other. On the No. 35, an extra motor pulley is furnished which, when installed, provides a second spindle speed. On the No. 45 through 65A, the second spindle speed is obtained by changing the spindle pulley. A motor hook is provided so that the weight of the motor can be supported from the column during the time the pulley is being changed. In all cases, belt tension is determined by the position of the motor. Do not allow the motor to "hang" on the belts. Vee belts should not be too tight, both from a wear and vibration standpoint. Replacement belts should be purchased in matched sets. Do not run new and old belts on the same pulley at the same time as the new belts will take the load and the old belts will introduce excessive vibrations in the machine.

Spindle speeds should be changed from low to high when wheels wear down to the dimension listed under "High Spindle Speed - Wheel Size" in the table below.

	<u>LOW SPINDLE SPEED</u>		<u>HIGH SPINDLE SPEED</u>	
	Wheel Size	Speed (RPM)	Wheel Size	Speed (RPM)
No. 25	8	2900	7	3400
No. 28, 35, 36, 38, 38A	10	2300	8	3000
No. 45, 45A, 55, 55A, 65, 65A	14	1800	11	2140

OPTIONAL EQUIPMENT

HAND LONGITUDINAL TABLE MOVEMENT (See Standard Equipment for No. 25, 28 and 35). This attachment is interlocked with the table stop and start valve handle which makes it impossible to start the table hydraulically while the hand feed pinion is engaged with the table rack. Similarly, it is impossible to engage the hand feed pinion while the table is being operated hydraulically. **

COOLANT SYSTEM An adequate supply of clean coolant is essential to good grinding. Tanks should be cleaned at frequent intervals. To clean the tank, remove the tank cover and wheel the tank to the dump. A locating bracket on the base of the machine insures a proper alignment between the tank and the machine.

DUST COLLECTING SYSTEM Fan motors should be connected to run clockwise when viewed from the fan end.

POWER ELEVATION OF WHEEL HEAD This feature is optional on the No. 35, and standard on the No. 45 thru 65A. "Raise" and "lower" push buttons are grouped with other push buttons in the control box.

** See page 5.

ADDENDA

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POWER CROSS FEED To engage or disengage the cross feed while the table is in motion, apply just enough pressure on the lever so that when the table reverses the first time after applying such pressure, the lever will move to its proper position. If the table is stopped with the cross feed engaged, to disengage the feed it is necessary to turn the cross feed handwheel a slight amount in the direction in which it has been turning. It is then possible to throw the feed lever to its neutral position.

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HAND LONGITUDINAL TABLE MOVEMENT When changing from power feed of the table to hand feed on machines No. 35 to 65, where no provision is made for quickly disconnecting the piston rod from the table, the table will move easier in both directions if the speed control valve is opened to its maximum limit. This allows the oil from the table cylinder to be returned more freely to the supply tank. When changing back to power feed, it is best to let the table make a few idle strokes before grinding so as to insure that all the air has been forced out of the table cylinder.

Magnetic chucks furnished by us as original equipment are carefully checked to make sure the bottom is absolutely straight and flat. If not flat, when it is clamped to the surface grinder table, it will bend the table by whatever degree it varies from a perfect flat and then satisfactory production from the machine will be impossible. This is because chuck is thicker and stiffer than the table. If a chuck not purchased from us is found to be imperfect, it is essential that it be scraped or ground to a true flat before attempting to clamp it to the table. We find that a large percentage of chucks purchased from all chuck makers are not accurate enough to pass our inspection. You can usually check this by tissue paper feelers, placed at fairly frequent intervals, at the ends and along both front and back edges, using the ground surface of the table as a check means if an absolutely accurate surface plate of sufficient size is not available.

The initial grinding or regrinding of the chuck surface is a job that requires a special technique and great care. This is primarily because the "lead" filling has a tendency to fill up and thus "load" the wheel and a wheel that is loaded will not cut. The best wheel for chuck grinding is approximately A-36-J-7-V. But having the right wheel is only part of the art of grinding a magnetic chuck. The grinding wheel must be dressed with a diamond and a rather coarse dress is required. By this we mean that the diamond should be cross fed at a fairly rapid rate - not slowly as is good practice when dressing a wheel for fine finish grinding of normal work.

We recommend slowing the table down to between half and three-quarters of maximum speed. Then slowly lower the head until the grinding wheel just sparks at the back edge of chuck. Then stop the table at its extreme movement, where the wheel is beyond contact with the chuck surface, and cross feed by hand until you are in position to touch the front edge of the chuck. Then start the table up. If you get no spark at this point, where you had a barely perceptible spark at the other edge, then feed down not to exceed .0002" and start your cut. Have the automatic cross feed set for the greatest amount available. If you get a heavier spark at the second edge than you did at the first, stop the table immediately, at its extreme movement; run the head up a few thousandths, cross feed say 1/16" so as to have a fresh spot on the chuck to touch and down feed slowly until you get the first perceptible spark, then feed down .0002" more and start your cut across. If your second edge did not show any spark while the first one showed a perceptible spark, you will find it will commence to spark before you have gotten across the chuck. If your second edge was higher and showed more of a spark then your cut will run out and stop sparking before you get to the other edge. In either case let the cut go all the way across as long as there is any perceptible spark. Occasionally you can take two cuts across a small chuck without needing to dress, but never more than that. It is important that you dress every time the wheel starts to load up. It is important that you never attempt to take off more than approximately .0002" at each pass. A heavier cut than this will load the wheel up before you have completed the surface of the chuck once. On large size chucks, dressing should be done after each coverage.

It is important that chuck be ground with current on so that any heating tendency or stresses built up by magnetism will have had time to take effect before the grinding is undertaken.

While having the right sort of wheel is important, a good job can usually be done with wheels that vary considerably therefrom if the precautions and technique mentioned above are followed.

INSTRUCTIONS for LUBRICATORS TYPE "D", "H", "J", "K", "L"

The Bijur Lubricating System consists of a pump unit which forces oil through a branched tubing line to Meter-Units, one of these being located at or near each bearing. The pump measures the total quantity of oil fed to the system, the Meter-Units proportion this quantity according to the individual requirements of the bearings.

OIL. Use only a clean mineral oil of the proper viscosity, as recommended by the machine manufacturer. NEVER use so called dripless oil or oil containing graphite, soap or other foreign substance. Inspect the oil level in reservoir regularly and refill whenever three quarters of the supply has been used. Sudden descent of piston after releasing handle indicates reservoir is empty.

LUBRICATOR. Type D, H and J have the oil reservoir in unit with the pump; Type K and L have the pump in a unit mounted on the reservoir. Except in the case of Type L the piston is sealed by a cup leather. All pumps are of the spring discharge type. Operation is by the simple movement of a tee handle or lever, which raises the piston and compresses the spring. Return of the piston and discharge of oil to the bearings is automatic. The discharge will be slower with a cold machine and faster as the temperature rises. This variation in discharge time automatically compensates for changes in oil viscosity and temperature, assuring a constant volume of oil being fed to the bearings. The pump stroke is set by the machine manufacturer to suit each type of machine. No change should be made unless there is a definite necessity. Oil discharge volume may be increased or decreased by making the corresponding change in the piston stroke. On some types of lubricators external adjustments, by means of a screw or a link, are provided. When no external adjustment is provided, it will be necessary to remove the piston and rod assembly to make any change in stroke, holes being arranged in the piston rod as alternative positions for the cotter-pin. Should an adjustment be necessary, check piston stroke both before and after adjusting to see that the desired change has been made.

A filter disc located at the bottom of lubricator protects the lubricating system from chips and dirt. It is recommended that filter disc be inspected every six months. If not clean, replace it with a new one. (See illustration below for Part No., or specify according to complete lubricator type symbol stamped on name plate.)

METER-UNITS are self-contained, non-adjustable units. Letters stamped on them indicate the type, and numbers the flow rate. The higher the number the greater the flow. The Meter-Units offer such high resistance to oil flow, that they are the controlling factor in oil distribution, and there is practically no variation in oil delivery due to flow resistance in the tubing, variation in bearing wear or initial fit. Check valves in the Meter-Units prevent reverse flow and maintain the tubing full of oil at all times.

A Meter-Unit may be mounted directly at bearing or at adjacent junction or tee head.

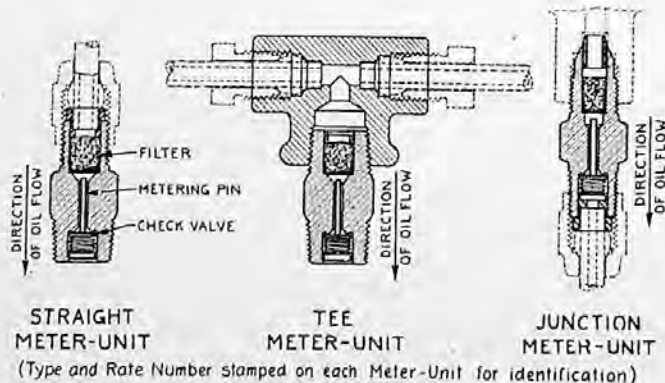
INSPECTION AND SERVICING. Operate lubricator and with the pump feeding to the system, inspect for evidence of oil at the bearings, also ascertain that there are no leaks at the tubes or connections.

IF CONDITIONS INDICATE THAT ALL BEARINGS ARE GETTING INSUFFICIENT OIL, INSPECT FOR:

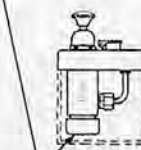
1. Low oil level in reservoir. (Indicated by instant return of operation handle.)
2. Broken or cracked tubes or loose connections. Wipe off tubes and connections and with the pump operating watch for leaks. When replacing a tube, see that it is properly clipped to prevent vibration.
3. Flattened lubricator pump outlet tube.
4. Clogged lubricator pump filter. Remove filter disc and replace with new one if available, otherwise wash thoroughly in gasoline until disc is clean and white. To remove filter disc, (except Type L) raise piston and block above its lowest position. Cylinder cap containing filter disc can now easily be removed.
5. Worn piston leather cup (except Type L). To replace leather cup, remove cylinder cap as explained in 4. then disconnect operating handle from piston assembly. Piston can be withdrawn from bottom of cylinder, and pump leather or complete piston and rod assembly can be replaced.

IF ONE BEARING ONLY IS GETTING INSUFFICIENT OIL, INSPECT FOR:

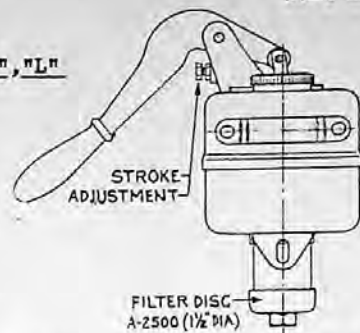
1. Flattened oil tube or loose connection to the tail pipe feeding this bearing.
2. Slow feeding Meter-Unit. Make sure oil reaches inlet of Meter-Unit when pump is feeding, also check rate of feed with Meter-Unit connected to drip free in air. Should there be any question as to the rate, compare it with a Meter-Unit of the same rate number on another part of machine. If Meter-Unit is feeding a proper quantity in accordance with its rate number, and an increased feed is desired, use same type and next higher rate number. Tee Meter-Units are replaced complete with head. Never disassemble a Meter-Unit or drill it out as this will ruin its operation. Do not try to test Meter-Units by blowing through them. Remember oil flows through Meter-Units very slowly and in one direction only, as indicated by arrow plainly stamped on each Meter-Unit.



FILTER DISC
B-4203 (1 1/8" DIA) LMH
A-3842 (1 1/8" DIA) LPK



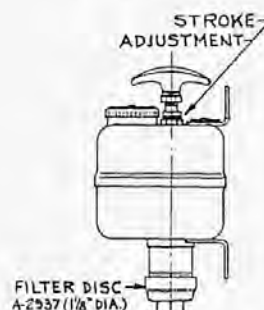
LUBRICATOR
TYPES LMH & LPK



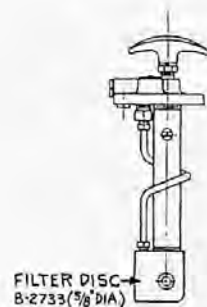
LUBRICATOR
TYPE D



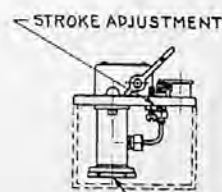
LUBRICATOR
TYPE HIA & JIA



LUBRICATOR
TYPE HIB, HIC & JIB



LUBRICATOR PUMP
TYPES KIA & KIB



LUBRICATOR
TYPES LMA, LMB,
LMG, LML & LIF

MAINTENANCE INFORMATION
FOR
VICKERS
BALANCED PISTON HYDROCONE TYPE
RELIEF VALVES

(DESCRIPTIVE BULLETIN 38-3; PARTS DRAWINGS 111-S & 165-S)

MODEL NUMBERS

This maintenance information is for Vickers Pressure Relief Valves of the Balanced Piston Hydrocone Type. Five series of model numbers, each designating a size group, are used. (Series C-167, C-167, C-180, C-181 and C-182.) The complete model number, which includes pressure range and any special feature designation, is stamped on each valve and should be carefully referred to when using parts drawings or when ordering parts.

Also, this maintenance information applies to the relief valves which are integrally designed into various other Vickers valve assemblies and pumps, such as the Series V-204 Vane Pump and Integral Relief Valve units as shown on installation drawings 29001, -2, -3.

DESCRIPTIVE INFORMATION

Parts drawings 111-S and 165-S give parts numbers for all major models, while descriptive bulletin 38-3 gives general information as to installation and usage. Typical installation circuit diagrams are also shown on this bulletin.

FUNCTION

The primary function of these valves is to limit the maximum pressure in the hydraulic system to any desired adjustable figure. Oil from the system is discharged from the "return" connection of the valve to the tank whenever pressure builds up to the required setting for which the valve is adjusted. This discharge prevents further build-up of pressure, and the valve thus limits the system pressure to the desired maximum.

Due to an unusual principle of construction, the Balanced Piston Hydrocone Type Valves can be used for an additional purpose in the control circuit. By using the 1/4" pipe thread "vent connection" (which is normally plugged) shown on the installation drawings in Bulletin 38-3, and a suitable "venting" control circuit such as those which have also been indicated on this same descriptive bulletin, it is possible to remotely or automatically drop the system pressure to a near-zero figure when desired. This venting arrangement is often used for automatically dropping pressure between working cycles of a machine. The term "venting" is used because of the fact that pressure on the upper side of the otherwise balanced control piston within the valve is dropped by connecting the upper chamber to tank (atmospheric) pressure through small piping connections and a control valve that, when opened, allows a small volume of oil to flow or "vent" continuously into the tank. This, in turn, causes the relief valve to open wide and allow the entire pump delivery to discharge back to the reservoir at very low pressure until the "venting" flow is blocked. Refer to Bulletin 38-3 for venting pressures of the various valve models.

INSTALLATION

Precautions as to installation are given at the bottom of the last page of Bulletin 38-3. Be certain that the piping from the valve "return" connection discharges oil to the tank below the surface of the oil in the tank. This will do a great deal toward preventing aeration and foaming.

PRESSURE ADJUSTMENT

The adjusting screw (13539) provides a convenient means of regulating the maximum system pressure within the range of the valve model used. A 1/4" pipe thread pressure gauge connection is provided at the side of the valve body (see Bulletin 38-3) and may be used for testing pressures if a pressure gauge is not permanently connected with the system at some other point. The jam nut (1487) must be loosened before turning the pressure adjusting screw (13539). Clockwise rotation of the latter increases pressure while counter-clockwise rotation decreases pressure.

(over)

On all applications the pressure relief valve should be set for the minimum possible pressure needed to perform the required service. If it is set for excessive pressure, more power will be used than is necessary whenever the valve is being held open. (Note: When used with Vickers metering-out or "locked" tool feed circuits, the pressure should be adjusted at the relief valve so that a pressure gauge reading taken at the discharge side of the feed cylinder is reduced to approximately 50 lbs. per sq. in. during the time that the most severe cutting conditions in the cycle are being encountered.)

CAUSES OF IMPROPER OPERATION

Fluctuating pressure or loss of pressure at the relief valve indicates that there is air mixed with the oil or dirt particles in it. Very small chips or filings left in the tubing or piping, wiping cloth lint, core sand, or any such foreign substances can cause trouble. Every possible precaution should be taken to prevent any grit or dirt from entering the system when piping the machine and filling the tank with oil. Also, precautions should be taken to protect the tank air vent opening so that the "breathing" action in the tank does not draw in dirt. Abrasive matter will cause pump wear and will prevent the proper operation of control valves. Dirt cannot get in if the precautions outlined are taken.

Small air bubbles often cause a "milky" appearance of the oil, and this air will usually cause noisy pump and relief valve operation, as well as prevent the valve from holding a pressure steadily. Check to make certain that all system return pipes (including drain connections) discharging oil to the tank are well below the oil surface level; also, that no air leaks are present in the pump intake line (refer to pump maintenance data). Both of these conditions will cause air to be mixed with the oil.

PROCEDURE WHEN SERVICING

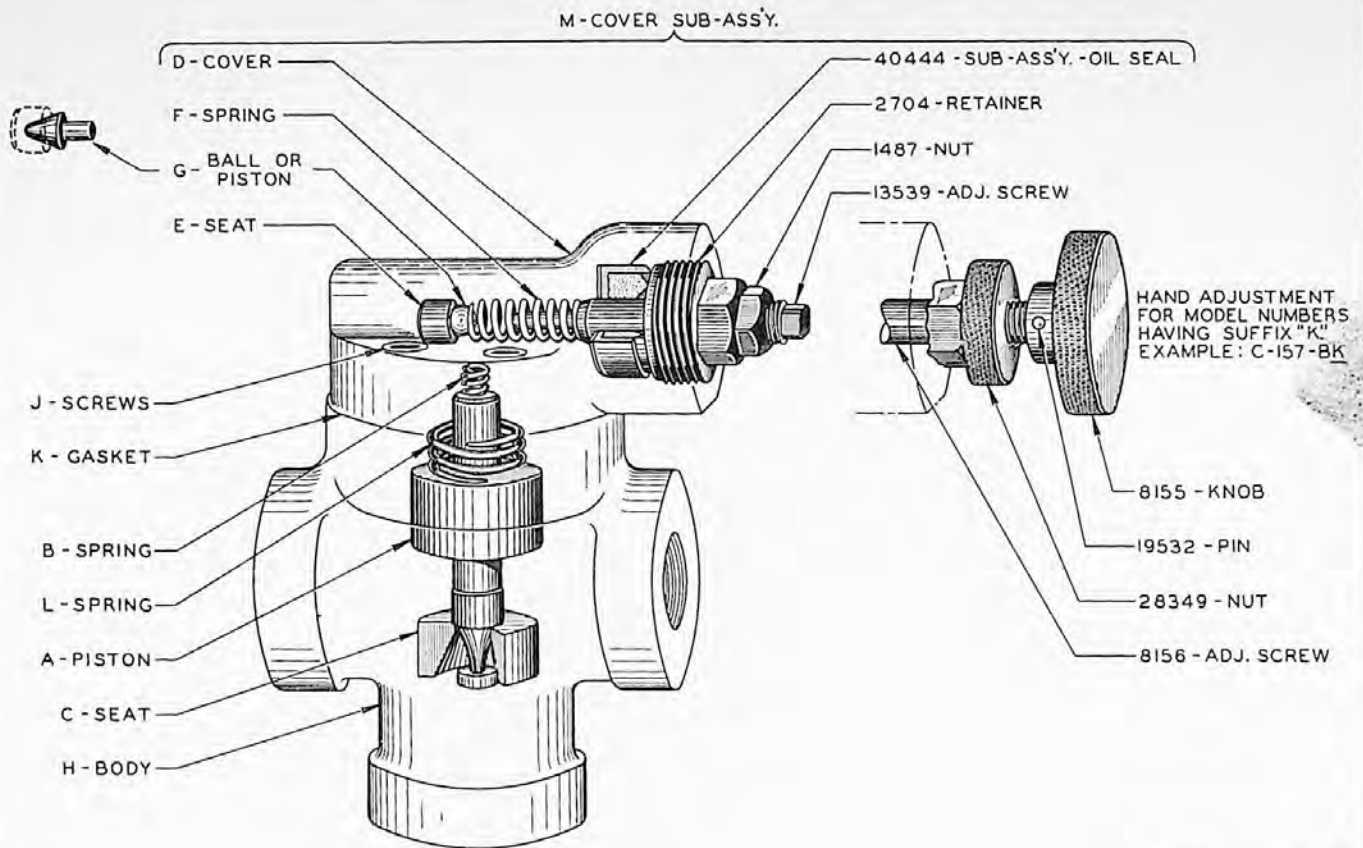
The relief valve is sometimes prevented from operating correctly by lint, pipe scale, or some other solid matter lodging between the pressure control ball or piston (G) and its seat (E). This results in fluctuating pressure or a complete drop in pressure. Usually the condition can be remedied by starting the pump and then loosening the jam nut (1487) and backing off the adjusting screw (13539) counter-clockwise until it reaches a shoulder which limits its outward travel. This relieves the pressure control spring (F) and often will allow the circulating oil to clean away the dirt. The relief valve adjustment should then be turned back clockwise until the proper pressure setting has been re-established.

If this procedure fails to cause the pressure to build up properly, the dirt or lint condition may be excessive and can only be remedied by removing the cover (D) from the valve body (H), which is held by four socket head fillister screws (J), then removing the operating piston (A) and its spring (B). Check to see that both small holes through the piston are clear and that the seat (C) appears in good condition. Also make certain that the piston (A) moves freely in the body and has no tendency to stick; also that it is equally free in the guide hole in the cover (D). When reassembling make certain the spring (B) is back in place and that cover gasket (K) is in good condition. If the auxiliary spring (L) is used, be certain that it also is in place. Cover screws (J) must be tight.

Inspection of the ball or piston (G) and the seat (E) should also be made while the cover (D) is removed. This is accomplished by unscrewing the packing retainer (2704). The oil seal sub-assembly (40444), the spring (F) and ball or piston (G) may then be removed. If the service has been severe it may be found that the hardened ball or piston (G) is worn, as evidenced by an annular groove. In this case it should be replaced. The ball or piston (G) should be resealed against its semi-soft seat (E) and this can readily be done by tapping the ball or piston (G) against the seat with the help of a brass rod and light hammer. Make certain when reassembling that the spring properly holds the ball or piston against the seat.

When reassembling be careful that not the slightest particle of grit is allowed to get on the ground valve parts, it being desirable to cleanse these with gasoline or kerosene.

**REPAIR PARTS
FOR SERIES C-157 & C-167
HYDROCONE TYPE RELIEF VALVES**



DRAWN	7-25-36	A.T.H.
CHECK	3-21-46	N.M.
RELEASED	8-1-46	R

MODEL NUMBER	PIPE SIZE	PRESSURE RANGE LBS./SQ. IN.	A PISTON	B SPRING	C SEAT	D COVER	E SEAT	F SPRING	G BALL OR PISTON	H BODY	J SCREWS	K GASKET	L SPRING	M COVER SUB-ASSY.
C-157-B	1-1/4	75 to 1000	51563	2000	2732	5106	2706	2282	1651	5758	1115	5107	—	28751
C-157-BV		75 to 1000	51563	28421	2732	8788	2706	2282	1651	5758	1115	5107	28422	28754
C-157-C		500 to 2000	51563	2090	2732	5106	2706	2281	82800	5758	1115	5107	—	28750
C-157-CV		500 to 2000	51563	28421	2732	8788	2706	2281	82800	5758	1115	5107	28422	28753
C-157-F		1500 to 3000	51563	2090	2732	5106	5339	2281	82800	5758	1115	5107	—	28752
C-157-FV		1500 to 3000	51563	28421	2732	8788	5339	2281	82800	5758	1115	5107	28422	28755
C-167-B	3/4	75 to 1000	51561	2077	56059	7274	2706	2282	1651	3855	1072	2085	—	19240
C-167-BV		75 to 1000	51562	—	56059	13449	2706	2282	1651	3855	1072	2085	28423	28763
C-167-C		500 to 2000	51561	2077	56059	7274	2706	2281	82800	3855	1072	2085	—	28758
C-167-CV		500 to 2000	51562	—	56059	13449	2706	2281	82800	3855	1072	2085	28423	28762
C-167-D		75 to 1000	6598	—	3111	6799	2706	2282	1651	3855	1072	2085	2998	19239
C-167-DV		75 to 1000	6598	—	3111	6799	2706	2282	1651	3855	1072	2085	37123	19239
C-167-E		500 to 2000	6598	—	3111	6799	2706	2281	82800	3855	1072	2085	2998	28765
C-167-EV		500 to 2000	6598	—	3111	6799	2706	2281	82800	3855	1072	2085	37123	28765
C-167-F		1500 to 3000	51561	2077	56059	7274	5339	2281	82800	3855	1072	2085	—	28759
C-167-FV		1500 to 3000	51562	—	56059	13449	5339	2281	82800	3855	1072	2085	28423	28764
C-167-G		1500 to 3000	6598	—	3111	6799	5339	2281	82800	3855	1072	2085	2998	28766
C-167-GV		1500 to 3000	6598	—	3111	6799	5339	2281	82800	3855	1072	2085	37123	28766

PRESSURE
CONTROLS

RELIEF
VALVES

HYDROCONE
TYPE

3/4" & 1-1/4"
PIPE SIZES

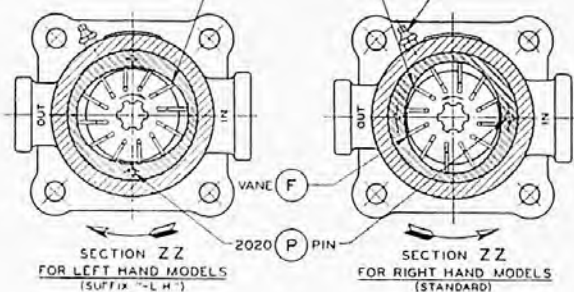
THREADED
CONNECTIONS

PARTS DRWG.
III-S

R-39102

SECTIONS BELOW ARE TAKEN VIEWING PUMP FROM HEAD END. RIGHT HAND MODELS HAVE CLOCKWISE ROTATION WHEN VIEWING SHAFT END; LEFT HAND MODELS COUNTER-CLOCKWISE ROTATION WHEN VIEWING SHAFT END.

VANES MUST BE ASSEMBLED SO THAT SMALL BEVELLED EDGES ARE TRAILING, AS DETERMINED BY DIRECTION OF ROTATION.

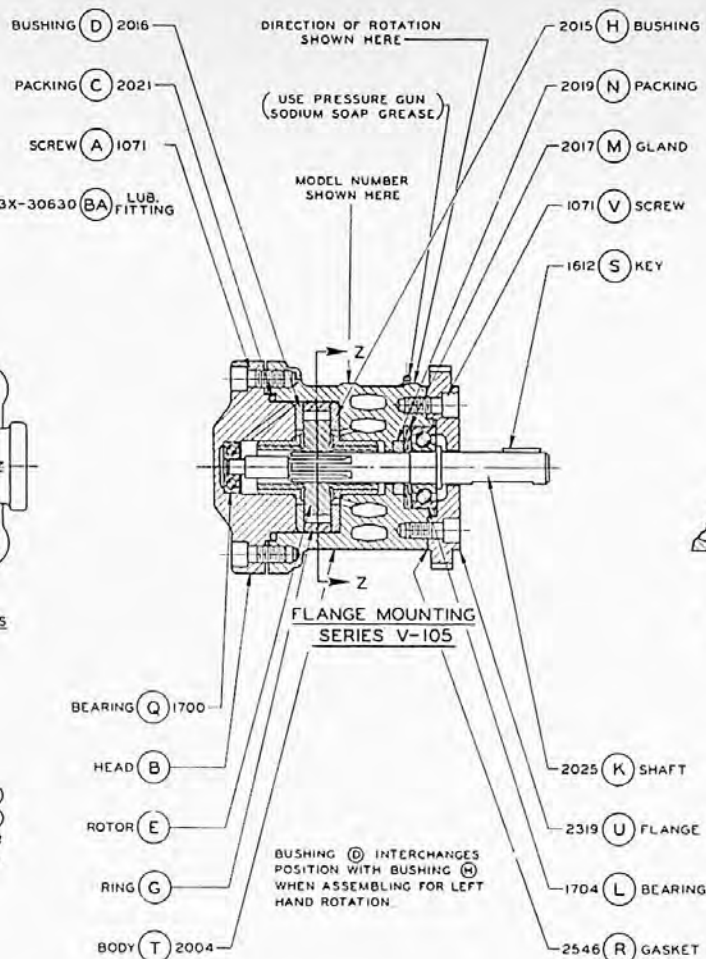


SMALL END OF PIN (P) EXTENDS INTO HEAD (B) WHEN ASSEMBLED FOR LEFT HAND ROTATION.

LARGE END OF PIN (P) EXTENDS INTO HEAD (B) WHEN ASSEMBLED FOR RIGHT HAND ROTATION.

PARTS SHOULD BE ORDERED BY NUMBER AS SHOWN ON DRAWING AND IN TABULATION GIVEN BELOW. MODEL NUMBER AS STAMPED ON PUMP SHOULD ALSO BE SPECIFIED

V-104-Y	V-105-Y	V-III-Y	2006	2008	2010	12220
V-104-F	V-105-F	V-III-F	2005	2007	2009	5850
V-104-E	V-105-E	V-III-E	2008	2008	2010	2299
V-104-D	V-105-D	V-III-D	2005	2007	2009	2014
V-104-C	V-105-C	V-III-C	2006	2008	2010	2013
V-104-A	V-105-A	V-III-A	2006	2008	2010	2011
FOOT MOUNTING	FLANGE MOUNTING	WITHOUT MOUNTING	HEAD	ROTOR	VANE	RING
MODEL NUMBERS			B	E	F	G



NO MOUNTING
SERIES V-III

FOOT MOUNTING
SERIES V-104

CAUTION
PRECISE ALIGNMENT WITH DRIVE SHAFT COUPLING MUST BE MAINTAINED WHEN MOUNTING AND PIPING PUMP.

INLET AND OUTLET PORTS REMAIN AS SHOWN (NOT INTERCHANGED) REGARDLESS OF DIRECTION OF SHAFT ROTATION.

PARTS USED FOR L.H. ROTATION AND R.H. ROTATION ARE IDENTICAL. REFER TO SERVICE DATA SHEETS FOR INSTRUCTIONS IF ROTATION MUST BE CHANGED AFTER ORIGINAL ASSEMBLY.

SUFFIX "-L-H-" IS ADDED TO MODEL NUMBER TO SPECIFY LEFT HAND ROTATION. HAND OF ROTATION IS ALWAYS DETERMINED BY VIEWING PUMP FROM SHAFT END.

CAUTION MUST BE EXERCISED DURING ASSEMBLY THAT SCREWS (A) ARE TIGHTENED MODERATELY AND EVENLY. SHAFT SHOULD BE TURNED BY HAND WHILE TIGHTENING TO TEST PROPER TAKE UP.

CAUTION: THESE PUMPS ARE CALLED UPON TO WORK AT HIGH PRESSURES. CLEAN OIL WHICH IS FREE FROM PIPE SCALE, CHIPS, ABRASIVE, WATER, AIR, ETC. MUST BE PROVIDED. STRAIN OIL CAREFULLY AND PROTECT RESERVOIR FROM DIRT.

OIL VISCOSITY RANGING BETWEEN 150 (LIGHT) AND 225 (MEDIUM) S.S.U. AT 100°F. FOR AMBIENT TEMPERATURES ABOVE 65°F IS RECOMMENDED.

MAXIMUM OPERATING PRESSURE 1000 LBS. PER SQ. INCH.

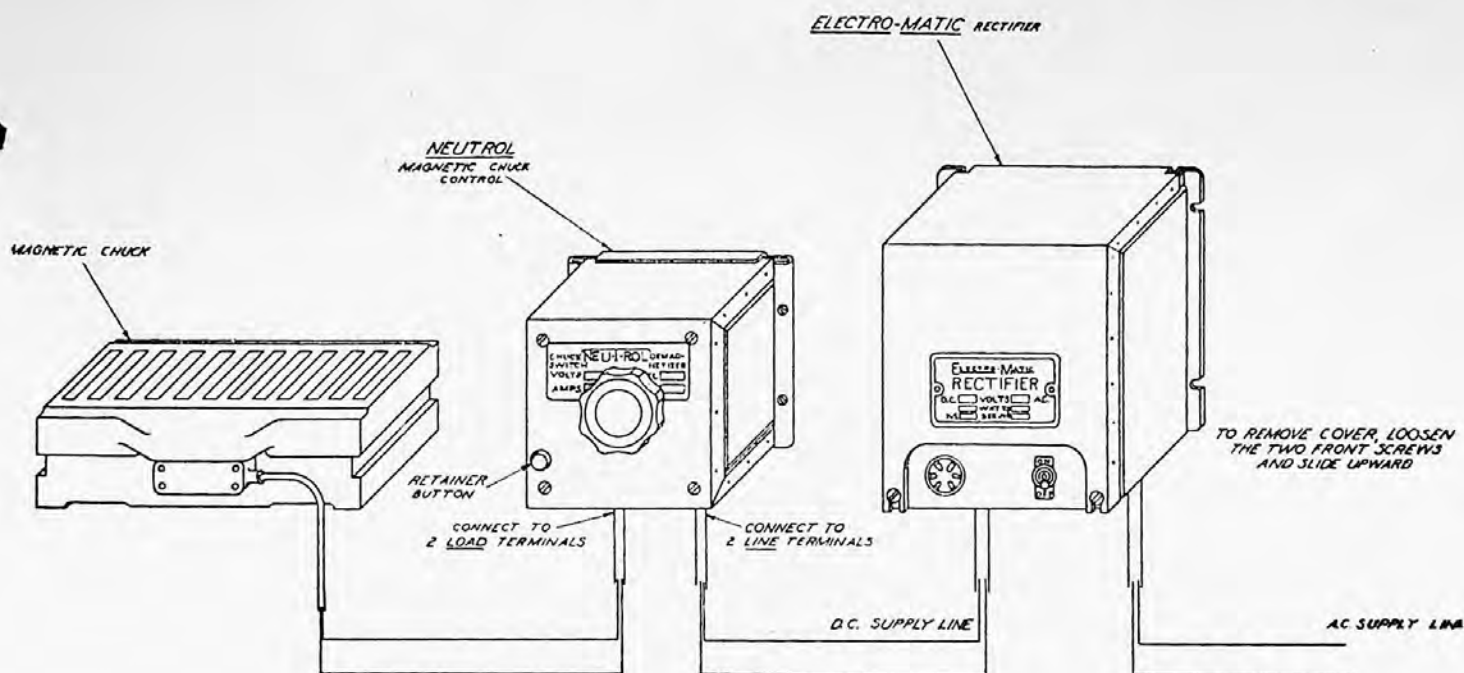
OPERATING DATA AND DIMENSIONS OF PUMP MODELS LISTED ON THIS PARTS DRAWING ARE SHOWN ON VICKERS DESCRIPTIVE BULLETIN 36-12.

PARTS FOR LARGER SERIES PUMPS SHOWN ON DRWG. R-39001.

VICKERS Inc.
DETROIT MICHIGAN

CORRECTION DATE	VICKERS INCORPORATED
RELEASED - 2-1-30	DETROIT, MICH.
	PARTS DRAWING
	CONSTANT DELIVERY VANE TYPE
	SINGLE PUMP
	SMALL SERIES
	1/2" SCALE
	R 39102 DATE 11-30-30 M.M.M.

MODEL "J" RECTIFIER INSTRUCTIONS



INSTALLATION:

This unit can be mounted directly on the machine, but should be mounted at a point where it will not be subjected to excessive vibration or physical damage. A cord connector is provided on the D.C. output side of the Rectifier to receive the plug from the Magnetic Chuck. The units arranged for 110 Volt A.C. operation are equipped with a plug for operation from any convenient receptacle, while all models arranged for any other A.C. Input should be connected directly to the line side of the disconnect switch controlling the grinder motor. On three phase circuits, the connections should be made to the two lines of the lowest potential to ground.

OPERATION:

A line switch is provided on the Rectifier and should be used only to turn the Rectifier on and off. This is very important. This switch should not be used to control the Magnetic Chuck nor should the Rectifier be started with the D.C. load applied. The Rectifier should be turned on one or two seconds before the D.C. load is applied in order to allow the mercury in the tubes to vaporize. Starting the Rectifier with the D.C. load applied will shorten the life of the tubes and possibly snap the filaments.

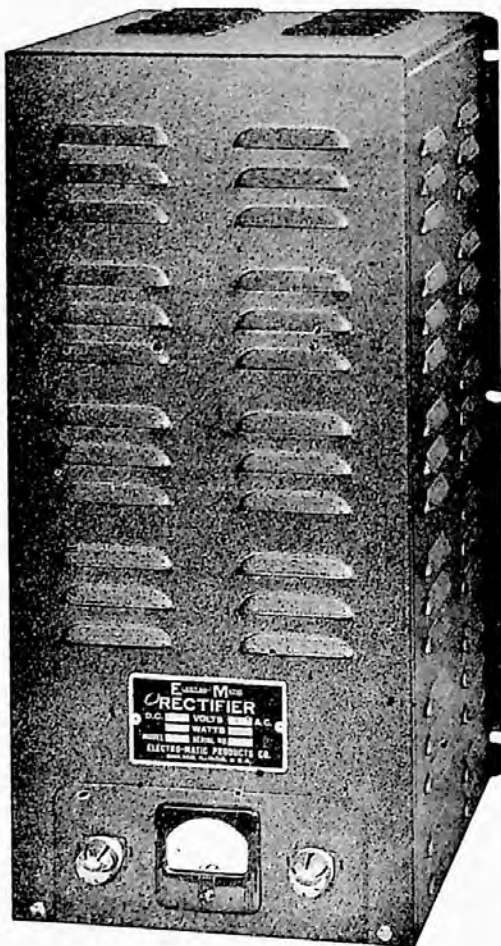
ELECTRO-MATIC PRODUCTS CO.

2235-37 N. KNOX AVENUE • CHICAGO 39, ILLINOIS

Printed in U.S.A.

INSTALLATION AND OPERATING INSTRUCTIONS

ELECTRO-MATIC **RECTIFIERS**



Equipped with the . . .

**ELECTRO-MATIC
ELECTRONIC
TIME DELAY SWITCH**

MODELS

LT

MT

P

P5

R2

R3

R50

R75

R100

R150

R200

ELECTRO-MATIC PRODUCTS CO.

Manufacturers of the NEUTROL Electro-Magnetic Chuck Controls

2235-37 NORTH KNOX AVENUE

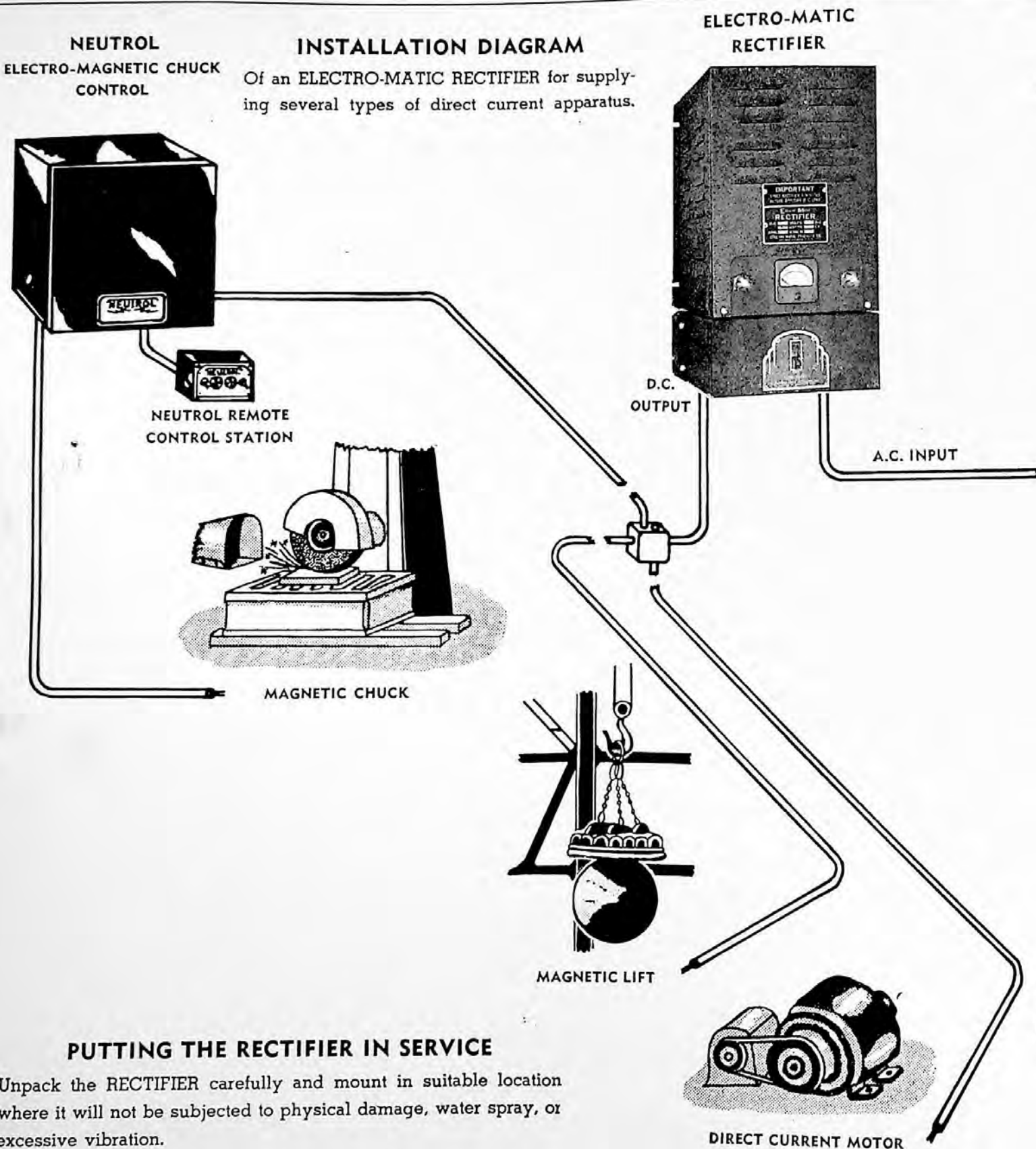
CHICAGO 39, ILLINOIS

RECOMMENDED INSTALLATION PROCEDURE FOR YOUR ELECTRO-MATIC RECTIFIER TO OBTAIN FULL EFFICIENCY

NEUTROL
ELECTRO-MAGNETIC CHUCK
CONTROL

INSTALLATION DIAGRAM

Of an ELECTRO-MATIC RECTIFIER for supplying several types of direct current apparatus.



PUTTING THE RECTIFIER IN SERVICE

Unpack the RECTIFIER carefully and mount in suitable location where it will not be subjected to physical damage, water spray, or excessive vibration.

To remove cover, loosen the two front screws and lift cover upward.

FOR MAXIMUM PERFORMANCE

The ELECTRO-MATIC RECTIFIER will deliver a steady flow of direct current to your equipment within its rated capacity with practically no voltage fluctuation within the unit itself. It is, therefore, suggested that this unit be connected to a circuit independent of one with excessive variable loads. This unit will give many years of satisfactory performance, providing it is connected and used within reasonable limits of its rated capacity. The A.C. voltage applied to this RECTIFIER should be within 10% of that indicated on the name-plate.

INSTALLATION

With the ELECTRO-MATIC RECTIFIER combination unit additional fusing or protective devices are not required. The combination unit consists of the ELECTRO-MATIC RECTIFIER, wiring trough, switch, and fuse compartment (as shown at left). If you do not have the ELECTRO-MATIC RECTIFIER combination unit be sure a fuse disconnect switch is inserted in the A.C. supply line to protect the RECTIFIER against short circuits or excessive over-loads.

All wiring to and from this unit should be well insulated to minimize the possibility of grounds or short-circuits.

After connections are properly made to the A.C. and D.C. terminals of the RECTIFIER, the half-wave rectifying tubes should be secured firmly in their respective sockets. The anode clips should then be fastened to the terminal caps of the rectifying tubes or the anode leads to the anode terminal posts. Check RECTIFIER for proper operation and then replace cover and fasten securely.

ELECTRO-MATIC ELECTRONIC TIME DELAY SWITCH

This RECTIFIER is equipped with an automatic time-delay to insure protection against tube failures due to the application of the D.C. load before the rectifying tubes have reached their proper operating temperature. The electronic time delay is factory adjusted and fully automatic. Once adjusted, further attention is not needed, as it derives its control medium from the D.C. output of the rectifying tubes, the ambient temperature and the applied voltage. A momentary voltage failure will not cause the time delay to recycle, it will act instantly within the operating temperature of the rectifying tubes. In the case of a sustained A.C. voltage cut-off, it will recycle only to the extent to which the rectifying tubes have cooled below their normal operating temperature.

The small variable control on the top of the chassis (as shown at lower left) is adjusted at the factory with the proper time allowance made for each model at the standard voltage and need not be readjusted except when tubes are

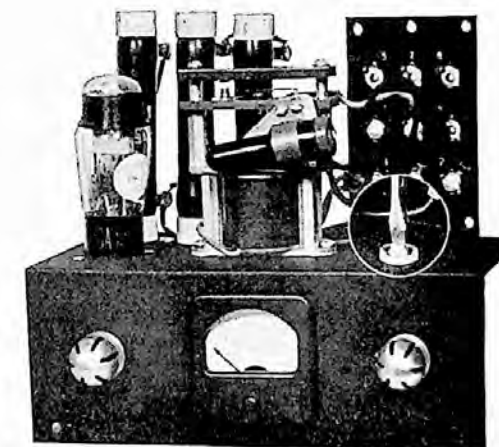
changed or under certain voltage conditions. If the control must be readjusted, proceed as follows: Turn the adjustment completely to the left and then apply A.C. voltage to the RECTIFIER. The red pilot light (at right) indicates the applied A.C. voltage. When the emission starts at both tubes and full voltage is indicated on the voltmeter, wait

minutes and then turn the adjustment slowly to the right until the solenoid actuates the mercury switch. At this point the white pilot light (at left) will glow, indicating that the D.C. voltage has been applied to the output terminals. The purpose of this control is to obtain the proper time-delay on a cold start and yet provide for an instantaneous reclosure of the relay in case of a momentary A.C. voltage failure.

Never tip the mercury switch by hand. By forcing the mercury switch, there is a possibility of puncturing the cylinder and unbalancing the switch.

GUARANTY

Each ELECTRO-MATIC RECTIFIER has been carefully inspected and tested under full operating conditions before shipment. The RECTIFIER is guaranteed for one year. If during that time repair or replacement is required due to defective workmanship or material they will be made without cost, provided the rectifier has not been subjected to physical damage beyond our control.



THESE INSTRUCTIONS COVER

Model	Wattage	Height	Width	Depth	
LT	250	9"	10 $\frac{3}{8}$ "	11"	50-60 CYCLES SINGLE PHASE INPUT FULL WAVE DIRECT CURRENT OUTPUT
MT	500	13"	10 $\frac{3}{8}$ "	11"	
P	1000	19 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
P5	1500	19 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
R2	2000	22 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
R3	3000	22 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
R50	5000	24"	20 $\frac{1}{2}$ "	10 $\frac{3}{4}$ "	50-60 CYCLES THREE PHASE INPUT FULL WAVE DIRECT CURRENT OUTPUT
R75	7500	24"	29 $\frac{7}{8}$ "	10 $\frac{3}{4}$ "	
R75	7500	24"	20 $\frac{1}{2}$ "	10 $\frac{3}{4}$ "	
R100	10000	24"	41"	10 $\frac{3}{4}$ "	
R100	10000	24"	29 $\frac{7}{8}$ "	10 $\frac{3}{4}$ "	
R150	15000	24"	59 $\frac{3}{4}$ "	10 $\frac{3}{4}$ "	
R150	15000	24"	41"	10 $\frac{3}{4}$ "	
R200	20000	24"	59 $\frac{3}{4}$ "	10 $\frac{3}{4}$ "	
LTS	250	13"	10 $\frac{3}{8}$ "	11"	25-30 CYCLES SINGLE PHASE INPUT FULL WAVE DIRECT CURRENT OUTPUT
MTS	500	19 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
PS	1000	22 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
P5S	1500	22 $\frac{1}{2}$ "	10 $\frac{3}{8}$ "	11"	
R2S	2000	24"	20 $\frac{1}{2}$ "	10 $\frac{3}{4}$ "	
R3S	3000	24"	20 $\frac{1}{2}$ "	10 $\frac{3}{4}$ "	
R50S	5000	24"	41"	10 $\frac{3}{4}$ "	25-30 CYCLES THREE PHASE INPUT FULL WAVE DIRECT CURRENT OUTPUT
R75S	7500	24"	41"	10 $\frac{3}{4}$ "	
R100S	10000	24"	59 $\frac{3}{4}$ "	10 $\frac{3}{4}$ "	

ELECTRO-MATIC PRODUCTS CO.

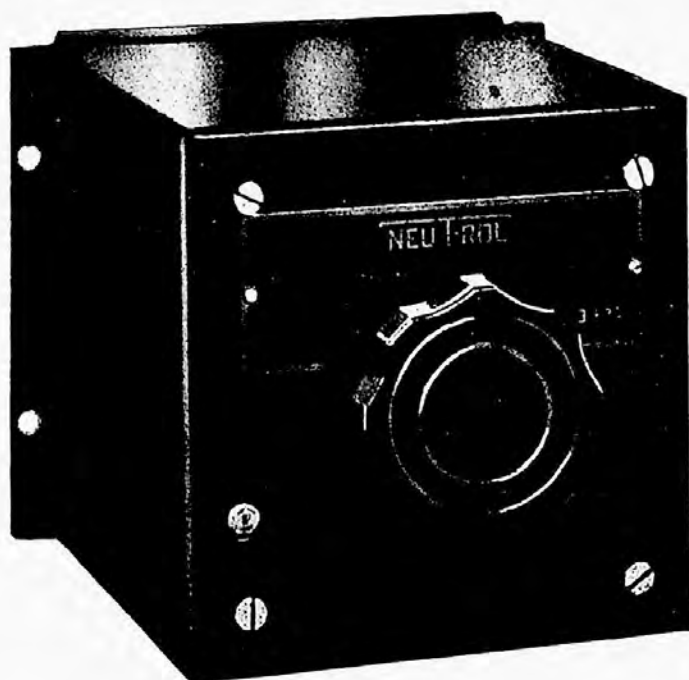
2235-37 N. KNOX AVENUE

CHICAGO 39, ILLINOIS



INSTALLATION AND OPERATING INSTRUCTIONS

FOR MANUAL
CONTROLLED



MAGNETIC CHUCK CONTROL

These Instructions Specifically Apply to Manual
Controlled Units—Models A - B - C

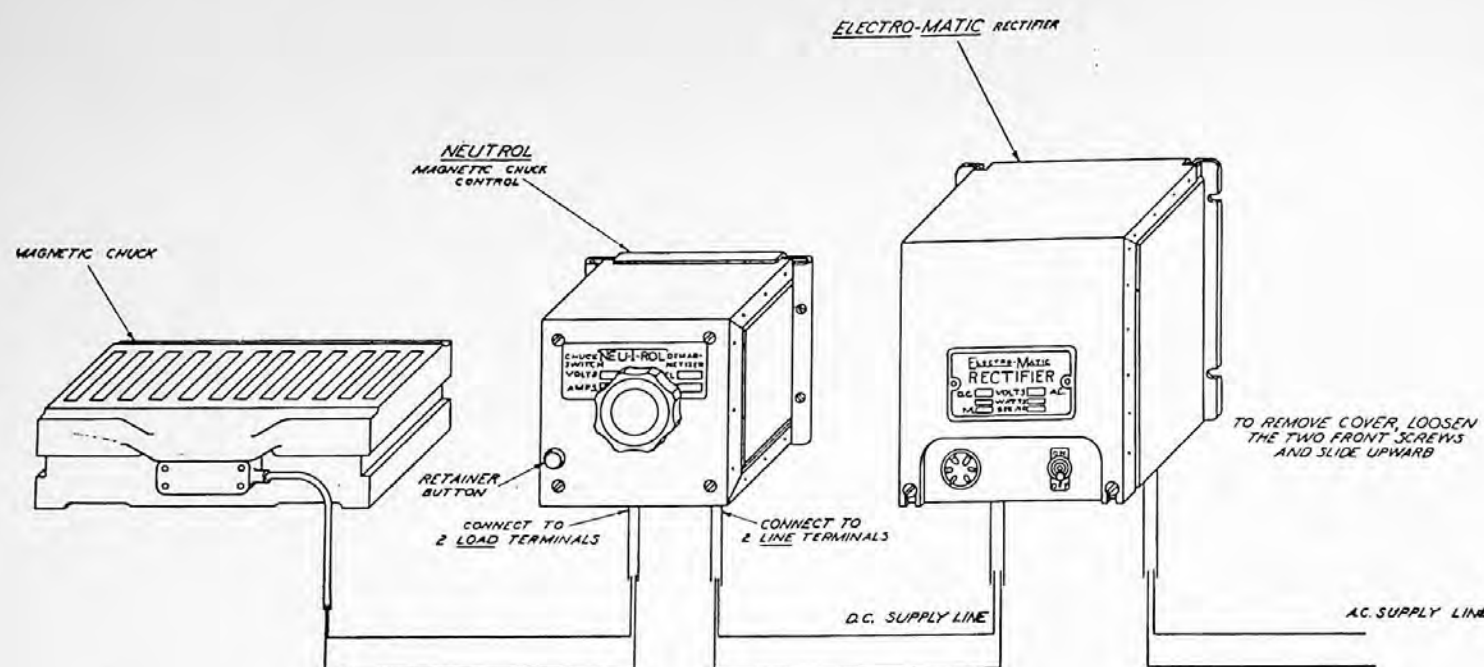
ELECTRO-MATIC PRODUCTS CO.

2235-37 N. KNOX AVENUE

CHICAGO 39, ILLINOIS



MAKING THE INSTALLATION



NEU-T-ROL should be securely mounted in a horizontal position on that part of the machine which will be most convenient to the operator.

To install NEU-T-ROL proceed as follows:

REMOVE REAR PLATE by sliding upward. This exposes the terminals for making connections. The terminals are plainly marked "Line," and "Load."

Insert wire through knockouts provided, using an insulated bushing for rubber cord to prevent abrasion. Wires should be anchored to the cabinet by tying a knot just above the bushing or by wrapping with tape to prevent excessive strain on the terminals.

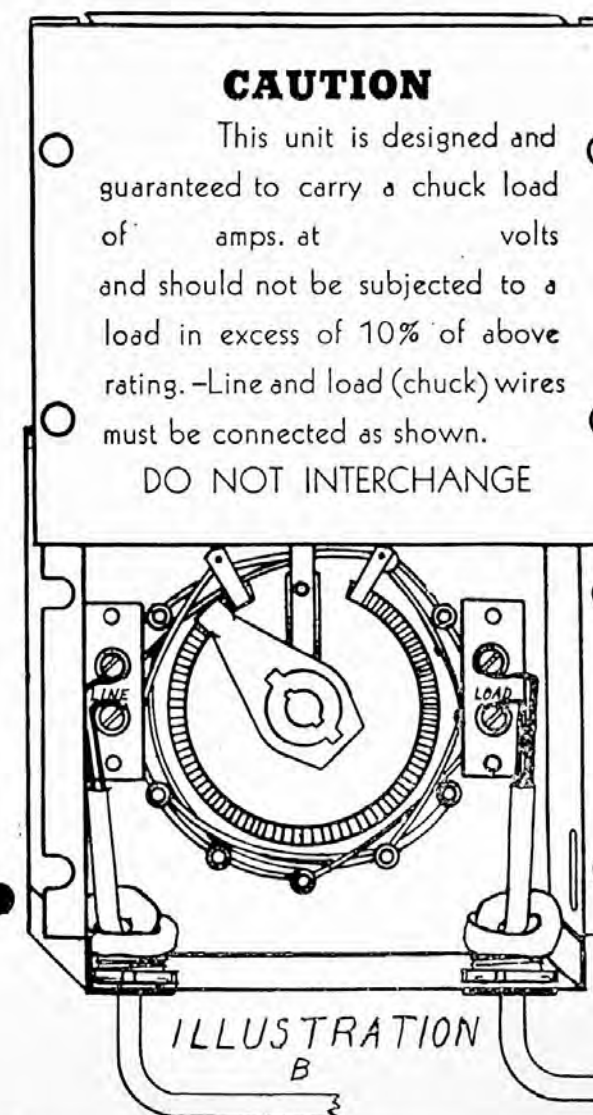
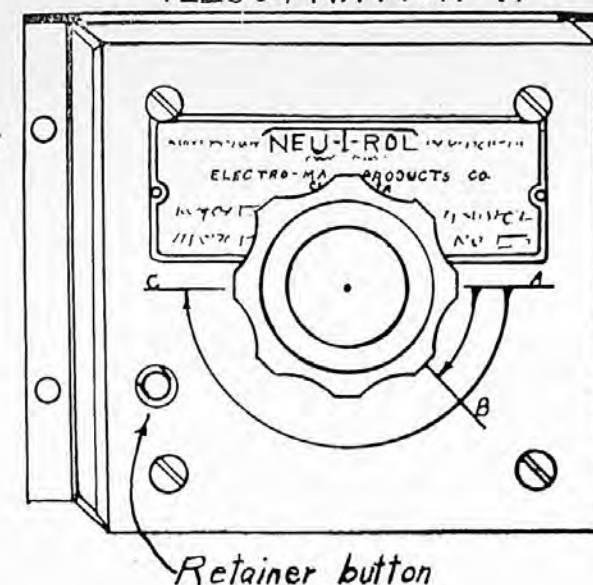
Connect the incoming D.C. Line to the "Line" terminals, and the Magnetic Chuck to the "Load" terminals.

All connections should be made permanent. Where cord connectors are used, a good grade of connector should be employed to eliminate the possibility of poor contact. Care must be exercised not to allow wires to interfere with the rotation of rheostat arm.

After connections are made to NEU-T-ROL, replace the rear cover over the flange on the cabinet. The cover is locked in position by means of the mounting screws supporting the NEU-T-ROL.

OPERATION IS VERY SIMPLE

ILLUSTRATION A



NEU-T-ROL Magnetic Chuck Control is "fully automatic" in its demagnetizing operation and requires no attention or adjustment by the operator. Each unit is correctly timed to control the magnetic chuck within its rated capacity.

Place the workpiece on the magnetic chuck and turn Knob of the NEU-T-ROL to the right until Latch is engaged. This holds the NEU-T-ROL in the full "ON" position and energizes the magnetic chuck. With a little practice, this can be accomplished with two strokes—one long and one short turn.

When grinding operation is finished, turn KNOB slightly to the left to disengage the Latch and allow NEU-T-ROL to return to the "OFF" position. This requires but a few seconds. To get the full demagnetizing effect, work should not be moved while NEU-T-ROL is in motion.

DO NOT ATTEMPT TO SPEED UP THE DEMAGNETIZING CYCLE BY FORCING THE KNOB. Forcing the Knob will reduce the efficiency of the NEU-T-ROL and cause excessive wear on the Governor and the Gear Train controlling it.

TO RETAIN RESIDUAL MAGNETISM

When it is necessary to grind light work that has become warped, and where the full magnetism of the chuck would tend to distort the workpiece, any desired amount of Residual Magnetism can be retained with NEU-T-ROL.

By turning the Knob slightly to the "right" and immediately depressing the Retainer Button (see sketch) full Residual Magnetism is retained.

For a lesser amount, turn the knob slightly higher and depress Retainer Button for a shorter period. To dispel the Residual Magnetism after the grinding operation is finished, turn Knob to the full "ON" position. Then release it and allow the work to remain on the chuck until Knob returns to the "OFF" position.

DO NOT ATTEMPT TO RETAIN NEU-T-ROL AT ANY INTERMEDIATE POINT.

AMPLE PROTECTION PROVIDED

The Suppressor Rheostat and all other current-carrying members are sufficiently heavy to withstand considerable overloads. However magnetic Chuck or the wiring between it and It IS RECOMMENDED that the D.C. supply to the NEU-T-ROL be properly fused to eliminate the possibility of a short-circuit in the Mr, they cannot be subjected to short-circuits. the NEU-T-ROL.

FOR BEST PERFORMANCE, full D.C. voltage should be applied and the supply should be of sufficient capacity so that the voltage will not fluctuate MORE THAN 5% between "NO" load and "FULL" load.

MAINTENANCE

When operated according to simple instructions, NEU-T-ROL will perform indefinitely with practically no attention, and without adjustments being required.

While it is not essential, if the contact surface of the Rotary Switch is occasionally cleaned (every 3 to 6 months), and a slight amount of vaseline applied, this will reduce wear and greatly prolong the life of the contacts.

OIL SHOULD NEVER BE APPLIED TO ANY PART OF THE MOTOR OF THIS UNIT. All bearings are self-lubricating and require no attention.

GUARANTY

NEU-T-ROL is guaranteed for one year. If during that time repair or replacement is required due to defective workmanship and materials they will be made without cost, provided that it has not been subjected to physical damage beyond our control.

THESE INSTRUCTIONS COVER—

Model	Type	Size	Watts	Maximum Chuck Area
				(Sq. In.)
A	Manual Control	5½" high 5" wide	50	60
B	Manual Control	5¼" deep	100	120
C	Manual Control	7" high 6½" wide 6½" deep	150	180

NEU-T-ROL

INSTALLATION AND OPERATING INSTRUCTIONS



Models E - F - G - H - S

GUARANTY

The NEU-T-ROL when operated according to instructions will perform indefinitely with practically no attention and is guaranteed for a period of one year against defective material and workmanship, during which time it will be repaired or replaced, providing it has not been subjected to physical damage beyond our control.

MAINTENANCE

The NEU-T-ROL requires no maintenance or adjustments other than an occasional cleaning of the contact surface of the rotary switch. It is recommended that at periods of from three to six months, the contacts be cleaned and a slight amount of vaseline applied. This is not altogether essential. However, it will reduce wear and greatly prolong the life of the contacts.

PROTECTION

The suppressor rheostat and all other current-carrying members are sufficiently heavy to withstand considerable overloads. However, they cannot be subjected to short-circuits.

The D.C. supply should be properly fused to protect the NEU-T-ROL in the event a short circuit develops in the magnetic chuck or the wiring between it and the NEU-T-ROL. (It is not necessary to fuse the D.C. supply when the NEU-T-ROL is used in conjunction with the ELECTRO-MATIC Rectifier as the line fuses supplying the ELECTRO-MATIC Rectifier are of sufficient protection.)

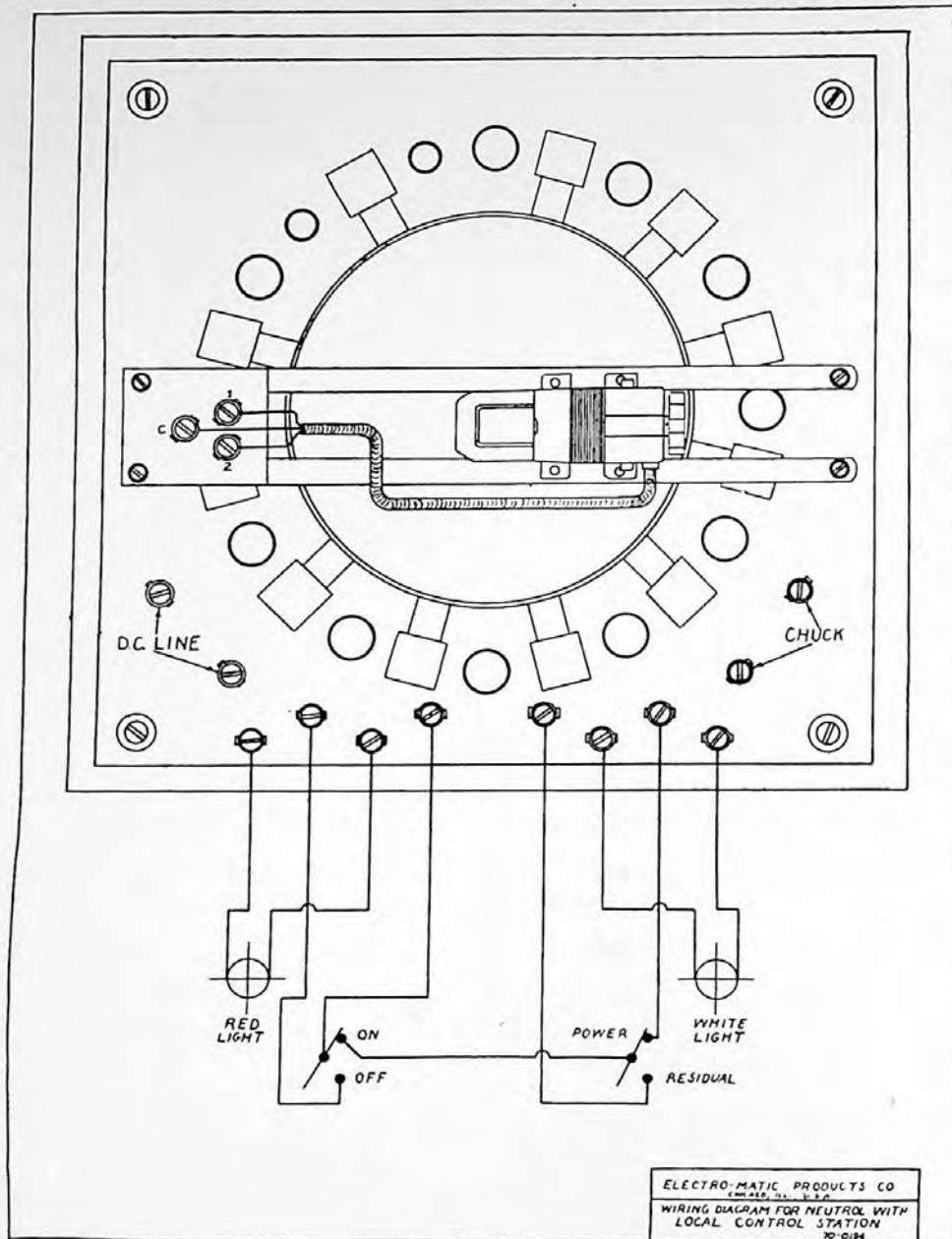
For best performance, the D.C. voltage should not fluctuate more than 5% during the demagnetizing cycle.

ELECTRO-MATIC PRODUCTS CO.

Chicago 39, Illinois

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LOCAL CONTROL

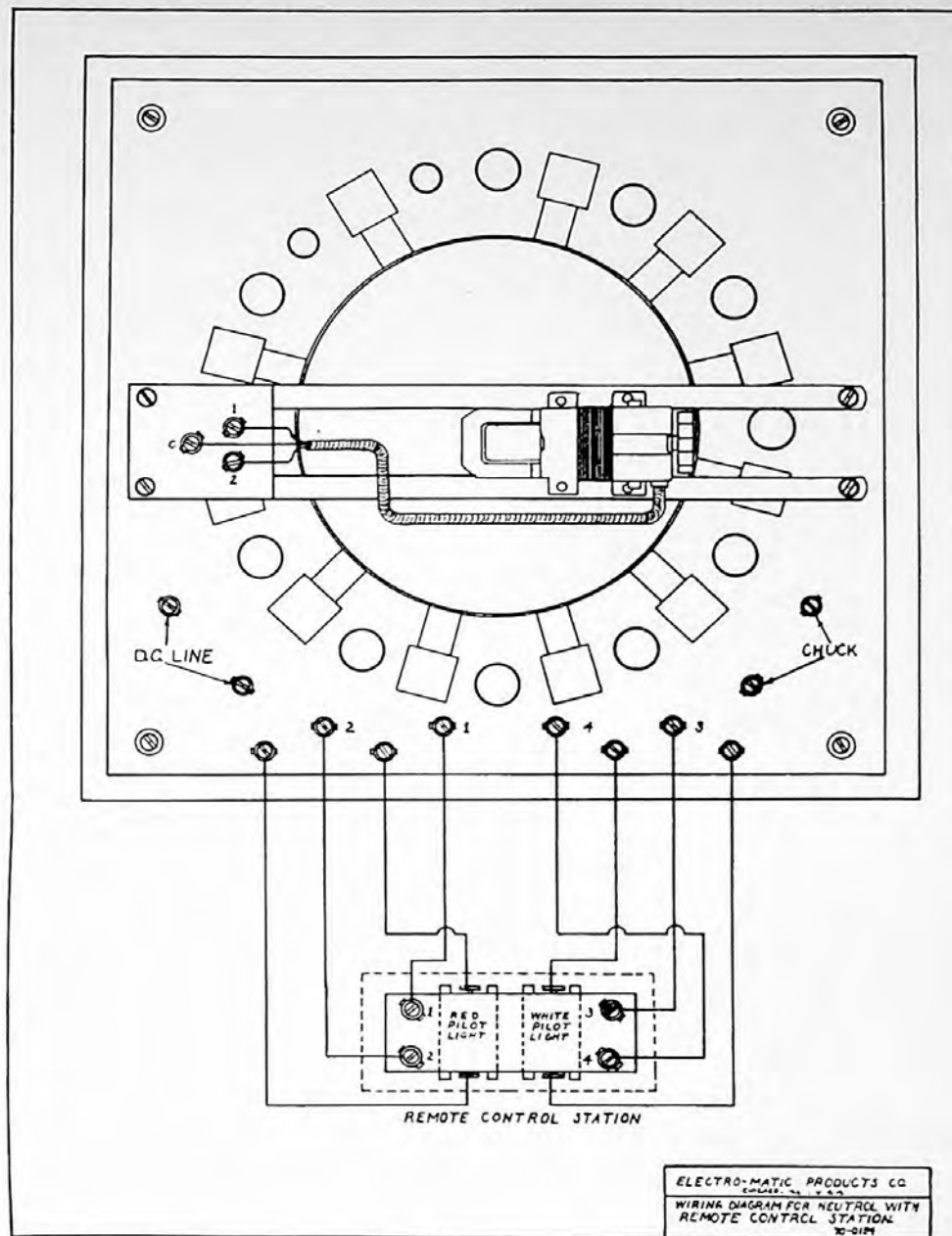


The NEU-TROL when arranged for local control should be mounted on some part of the machine convenient to the operator.

Remove cover and make line and load connections according to wiring diagram. It is only necessary to connect the two line wires and the two chuck wires to their respective terminals. **DO NOT INTERCHANGE.** All other connections are made at the factory and should not be changed.

The red pilot light is connected directly to the chuck terminals and definitely indicates whether the current is on or off to the chuck. The white pilot light is interconnected with the residual limit switch and indicates the residual position.

REMOTE CONTROL



When the NEU-TROL is arranged for remote control, the main unit can be mounted on some out-of-the-way part of the machine and the remote control station mounted in a convenient position to the operator.

Remove cover and make line and load connections and connections between the main unit and the remote control station. A good grade of insulated wire should be used. Four wires are used for the control switches and two for each pilot light. Make all connections as shown on the wiring diagram.

The red pilot light is connected directly to the chuck terminals and definitely indicates whether the current is on or off to the chuck. The white pilot light is interconnected with the residual limit switch and indicates the residual position.

NEU-T-ROL

OPERATION

The NEU-T-ROL Magnetic Chuck Control is fully automatic in its operation and requires no attention or adjustment by the operator. The operator needs only to select one of the three desired positions, namely: "on," "residual," or "off."

HEAVY PRODUCTION GRINDING

Assuming that all connections are properly made and the proper D.C. voltage applied to the NEU-T-ROL and the magnetic chuck, operate the NEU-T-ROL as follows:

For heavy production grinding, it is only necessary to operate the on and off switch, leaving the power-residual switch in the "power" position. The on and off switch will fully energize the chuck, depending on the applied D.C. voltage and will completely demagnetize it when thrown to the "off" position. To load the magnetic chuck, the control switch should be in the "off" position. After the work is properly placed on the chuck for grinding, throw the control switch to the "on" position, noting that the power-residual switch is in the "power" position. The red pilot light will indicate power to the chuck. After the grinding operation is completed, throw the on and off switch to the "off" position, and the NEU-T-ROL will begin its demagnetizing cycle. After several seconds, the work can be easily removed. The work should not be moved during the demagnetizing cycle.

GRINDING OUT THE HIGH SPOTS FROM WORK THAT HAS BECOME WARPED

Where it is necessary to perform light grinding operations or grind out high spots from work that has become warped, set the NEU-T-ROL in the "on" and "residual" positions. In these positions, the work is not held to the chuck with the full magnetizing power of the chuck, but rather with the residual magnetism retained in the chuck and the work-piece, which is sufficient under ordinary conditions for finish grinding. To demagnetize the chuck and the work-piece from this position, the on and off switch must be thrown to the "off" position.

GAUGING WORK BETWEEN GRINDING OPERATIONS

Where it is necessary to gauge work between grinding operations, as in cases where a large number of small pieces are loaded on the chuck, and it is necessary to remove one or more for gauging purposes between grinding operations, the power-residual switch should be thrown to the "residual" position. This will allow the operator to remove one or more pieces from the chuck without disturbing the entire lot. Upon replacing the work-pieces, the power-residual switch is again thrown to the "power" position and the grinding operation repeated. DO NOT ATTEMPT THIS PROCEDURE BY OPERATING THE ON AND OFF SWITCH, AS THE NEU-T-ROL WILL RELEASE THE WORK SO THOROUGHLY THAT WATER AND DIRT MIGHT SEEP UNDER THE WORK-PIECES AND THROW THEM OUT OF THEIR ORIGINAL POSITIONS.

The red pilot light indicates power to the chuck and the white light indicates the residual position.

ELECTRO-MATIC PRODUCTS CO.

2235-37 N. Knox Avenue

Chicago 39, Illinois

NEU TROL



MAGNETIC CHUCK CONTROL

*The Modern,
Efficient Method*

— of releasing the work piece from the chuck —
— that demagnetizes the work piece as it releases it.

— Also Offering These Additional Important Advantages:

- NEU-T-ROL** — dispenses with any damaging action to chuck as it positively eliminates having to hammer or pry off the work piece with mallet or crow bar —
- eliminates the cost and waste-time due to resurfacing the chuck for grinding to close limits —
 - prolongs the life of the chuck and associated equipment —
 - speeds up production through quick release of work piece —
 - saves the operator's energy and prevents injury to him —
 - protects the chuck against voltage surges —
 - pays for itself and then starts paying profits in a very short time.

ELECTRO-MATIC PRODUCTS CO.

2235-37 N. KNOX AVENUE

CHICAGO 39, ILLINOIS

NEU-TROL Contributes Another Long Forward Step For Production Increase In The Metal Working Industry

When magnetic chucks were first applied to grinding machines as a positive means of securely holding the work piece, they were credited as being great time savers which would step up production and save money. They have done that.

But with the advantage offered there was a consequent disadvantage: that of having the work piece adhere so strongly to the chuck that almost brutal, strong-arm methods had to be used — and still are used. When you have to PULL and SLIDE — HAMMER and PRY — the work piece from the chuck while attempting to operate a switch, you are wasting time — damaging the chuck — uselessly using up the operator's energy — and NEEDLESSLY BOOSTING PRODUCTION COSTS.

NEU-T-ROL POSITIVELY ELIMINATES ALL THESE COSTLY FACTORS

NEU-T-ROL was specifically developed for one purpose: To facilitate the quick and easy removal of the work piece at the completion of the grinding operation. . . . And until you use NEU-T-ROL you cannot realize how completely it does its job.

In the years of research which resulted in NEU-T-ROL, it was discovered that to release the work COMPLETELY, it was not only necessary to demagnetize the chuck but also the work piece.

NEU-T-ROL DOES THAT, and in the majority of cases to such an extent that the amount of magnetization remaining in the work piece is so small that it will not pick up metal particles which interfere with the production of precision grinding. NO OTHER DEMAGNETIZING IS NECESSARY — thus eliminating the necessity of demagnetizing after each grinding job.

WHY NEU-T-ROL IS FAR SUPERIOR TO AN ORDINARY REVERSING SWITCH

ONE OF NEU-T-ROL'S MOST IMPORTANT FEATURES is its ability to completely control the voltage in the winding of the chuck. With ordinary methods of control, the voltage in the winding of the chuck (at the instant the circuit is opened) is many times the normal voltage impressed upon it. Since this induced voltage is of opposite polarity to the previously impressed voltage, the magnetic fields set up in the chuck and work piece CANNOT BE DISPELLED by simply applying a reverse normal line voltage.

NEU-T-ROL IS VERY SIMPLE TO OPERATE

NEU-T-ROL is basically so simple to operate that the ONLY HUMAN FACTOR INVOLVED is the turning on of the power when the work piece is set upon the chuck, the completing of the grinding operation, and then the shutting off of the power. There are no dials to set or any adjustments to be made for each individual grinding job. . . . And why? . . . Because the size of the chuck on each individual machine determines the Model of NEU-T-ROL — and when that NEU-T-ROL is installed it positively controls the chuck.

WORK PIECE IS RELEASED IN A FEW SECONDS

When the grinding job is finished and the power is turned off, in a few seconds of time NEU-T-ROL de-energizes the chuck and the work piece so that it practically floats on the chuck. . . . JUST LIFT IT OFF. THAT'S ALL.

RETAIN RESIDUAL MAGNETISM IF DESIRED

With NEU-T-ROL you can have ONE ADDITIONAL ADVANTAGE — that of retaining Residual Magnetism where it is desired to remove a piece of work from the chuck for the purpose of gauging, or to change over from heavy grinding to light grinding on work that has become warped and where full magnetism of the chuck would tend to distort the work.

THERE'S NOTHING ELSE LIKE **NEU TROL** FOR THE POSITIVE CONTROL OF MAGNETIC CHUCKS

NEU-T-ROL is patented — and is the only product of its kind. It is a precision-built control, and constructed of such high quality of materials as to give many years of dependable service with practically no attention.

NEU-T-ROL is built for ANY SIZE of magnetic chuck.

NEU-T-ROL IS MADE IN TWO TYPES — to meet all magnetic chuck conditions:

MANUAL CONTROL — for small size chucks. Rectangular Chucks from 4 x 8" up to 7 x 24" and 8 x 22". Circular Chucks up to 14" diameter.

MOTOR OPERATED, for REMOTE CONTROL if desired. For Rectangular Chucks from 8 x 24" up to 24 x 168" and 30 x 220". Circular Chucks up to 72" diameter.

NEU-T-ROL QUICKLY PAYS FOR ITSELF. It saves time, increases production per machine and thus lowers production cost. It protects the operator and he is more alert because with NEU-T-ROL he is not needlessly robbed of energy by having to hammer and pry work from the chuck. . . . NEU-T-ROL protects the chuck against gouging and marring the surface. Expensive delays and resurfacing costs are consequently eliminated. . . . Thus in a short time NEU-T-ROL BECOMES A DIVIDEND PAYING INVESTMENT.

NEU-T-ROL IS FULLY AUTOMATIC IN OPERATION. Each size of NEU-T-ROL is scientifically "time-controlled" — the few seconds of time required for releasing the work piece and demagnetizing the work piece and chuck is in direct relation to the area of the chuck. NO HUMAN FACTORS — such as delicate timing — enter into its successful performance.



NEU-T-ROL IS EASILY INSTALLED

— on grinding machines NOW IN OPERATION in your plant —

— on NEW GRINDING MACHINES before delivery to you.

NEU-T-ROL IS COMPACT — occupies but small space. Each unit is completely housed in strong metal case.

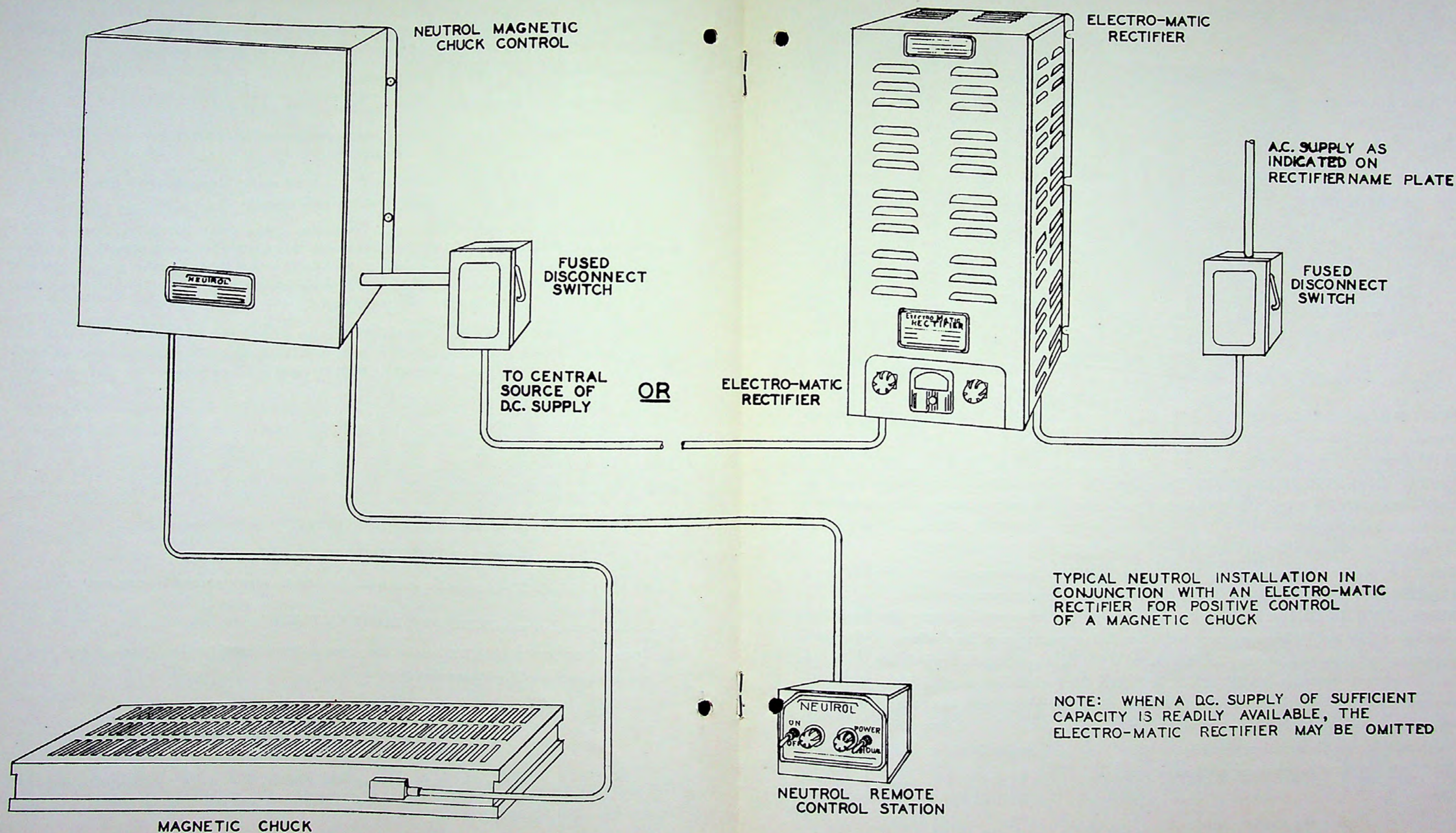
NEU-T-ROL is designed with TREMENDOUS SAFETY FACTORS.

NEU-T-ROL IS FULLY GUARANTEED for one year against all defects (materials and workmanship) when installed and operated according to simple instructions supplied.

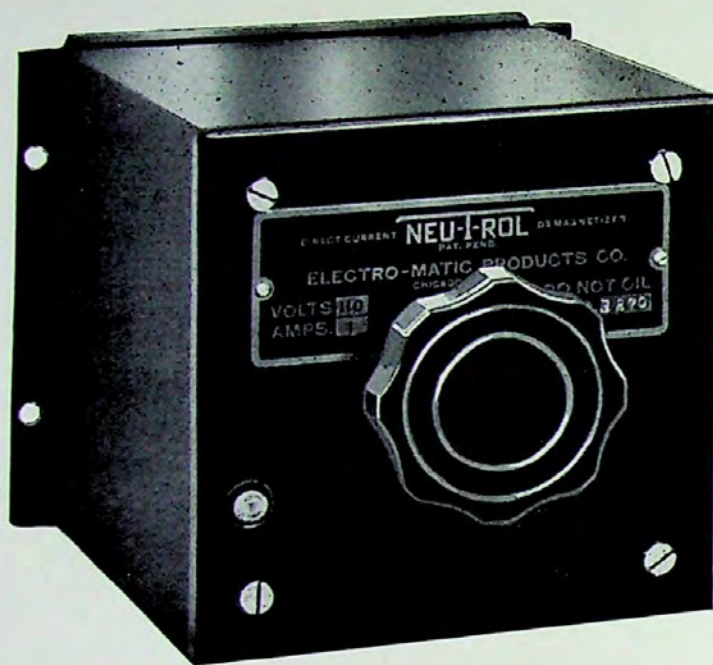


For increased production and lower cost, install NEU-T-ROL on grinding machines now in operation, or on new grinding machines before delivery to you.

YOU WILL SAVE TIME AND MONEY WHEN YOU HAVE **NEUTROL** MAGNETIC CHUCK CONTROLS
INSTALLED ON NEW GRINDING MACHINES AT THE FACTORY



NEU-T-ROL MANUAL CONTROLLED UNITS



NEU-T-ROL MANUAL CONTROL UNITS were primarily designed for the smaller sizes of electro-magnetic chucks that range from 4 x 8" rectangular size up to 7 x 24" and 8 x 22", and circular chucks up to 14" diameter.

OPERATION IS EXTREMELY SIMPLE. To energize the chuck turn the Knob to the right until the Latch is engaged. This is full "ON" position and you are ready to start grinding. When grinding is finished, turn Knob slightly to the left. This disengages the Latch and NEU-T-ROL automatically returns to the "OFF" position in a few seconds.

This "OFF" position reached means that the work piece and chuck is demagnetized and the work can be IMMEDIATELY LIFTED FROM THE CHUCK with all restraining magnetism removed.

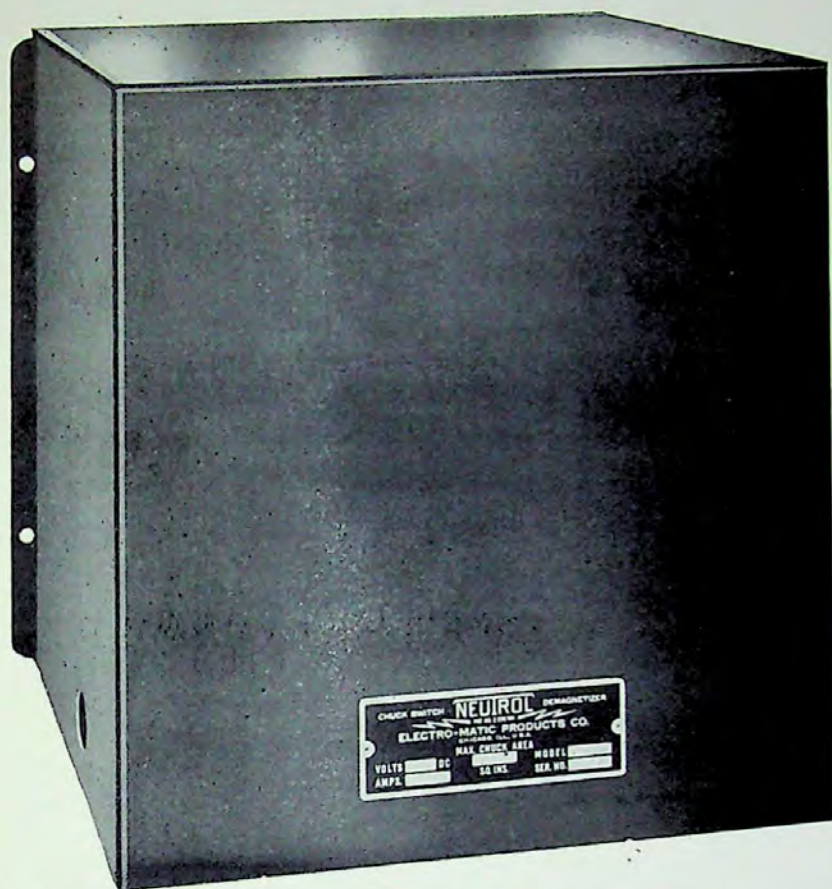
RESIDUAL MAGNETISM can be retained. When necessary to change over from heavy grinding to light grinding on work that has become warped, and where full magnetization of the chuck would attempt to distort the work piece, you can set up RESIDUAL MAGNETISM by turning the Knob slightly to the right and immediately depressing the RETAINER BUTTON (near lower left corner of front panel). This amount of residual magnetism is sufficient to accomplish light grinding. For a lesser amount of residual magnetism, turn Knob slightly higher and depress the Retainer Button for a shorter period.

To dispel this residual magnetism, turn Knob to "ON" position, immediately release the Latch and when "OFF" position is reached you remove the work piece.

SIMPLE, ISN'T IT? . . . And that's all there is to it!

NEU-T-ROL MOTOR CONTROLLED UNITS

Arranged for REMOTE CONTROL With "Finger-Tip" Operation



NEU-T-ROL Motor Controlled Units are designed for the larger size electro-magnetic chucks — and for REMOTE CONTROL operation where it is desirable to install NEU-T-ROL at some position other than where it might be in the operator's way. (This type of installation is simple to accomplish.)



REMOTE CONTROL

These NEU-T-ROL units have two switches: "ON-OFF" and "POWER-RESIDUAL."

To energize the chuck set the "POWER-RESIDUAL" switch at "POWER" and the Control Switch at "ON." The RED PILOT LIGHT will go on immediately. You are ready to start grinding and when this operation is finished turn the switch to "OFF" position. The Red Pilot Light will blink — decrease in brilliancy — and go out IN A FEW SECONDS, indicating that the work is neutralized and FREE TO BE REMOVED FROM THE CHUCK. . . . THAT'S ALL THERE IS TO IT!

RESIDUAL MAGNETISM MAY ALSO BE RETAINED IN THESE MOTOR CONTROLLED UNITS

When necessary to grind work that has become warped and where full magnetization of the chuck would tend to distort it, sufficient RESIDUAL MAGNETIZATION to hold the work during grinding can be retained.

This is accomplished as follows: Set control switch to "ON" and right hand switch to "RESIDUAL." NEU-T-ROL will automatically move to full on position and then immediately return to neutral. Pilot lights indicate this by Red Pilot Light going on and then off, followed by White (Residual) Pilot Light going on and remain burning as long as NEU-T-ROL is in this position.

Light grinding work may now be undertaken and when finished merely set the control switch to "OFF." The White Light will go out, the Red Light will oscillate, go out in a few seconds, and the work removed from the chuck.

FOR CHANGING FROM HEAVY TO LIGHT GRINDING ON THE SAME WORK, to retain sufficient Residual Magnetism, with the control switch "ON" you merely shift from "POWER" to "RESIDUAL," complete this part of the work, and then turn control switch "OFF" to release the work. (Pilot Lights will act as indicated above.)

Simple — Saves Time — Saves Money — Saves the Chuck — Saves the Operator

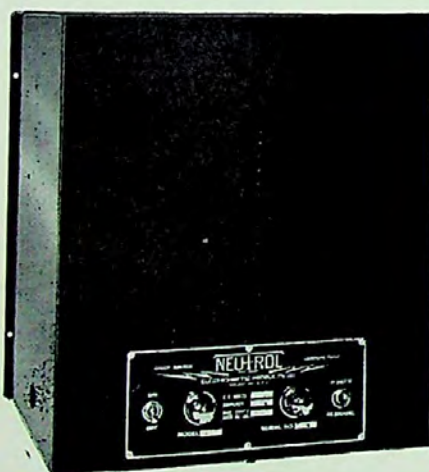
Order Direct From Us - Or From Your Regular Supplier

NEU-T-ROL SPECIFICATIONS

NEU-T-ROL UNIT PRICES AND SIZES depend upon the Chuck Area in Square Inches.

FOR RECTANGULAR CHUCKS: Multiply length by breadth.

FOR CIRCULAR CHUCKS: Square the diameter and multiply by .7854.



MODEL	TYPE	SIZE	WATTS	MAXIMUM CHUCK AREA (SQ. IN.)
A	Manual Control	5 1/2" high 5" wide	50	60
B	Manual Control	5 1/4" deep	100	120
C	Manual Control	7" high 6 1/2" wide 6 1/2" deep	150	180
E	Motor Control	10 3/4" high 9" wide	300	350
F	Motor Control	8 3/4" deep	500	600
G-750	Motor Control	12" high 10 1/2" wide	750	850
G-1000	Motor Control	9 1/2" deep	1000	1200
H-1500	Motor Control		1500	1800
H-2000	Motor Control	15 1/4" high 13" wide 9 3/4" deep	2000	2400
S-2000	Motor Control		2000	3000
T-45C	Motor Control	18" high 19 1/4" wide 14 1/4" deep	3000	4500
W-75C	Motor Control	On request	5000	7500

NOTE: FULL LINE VOLTAGE indicated on Name Plate should be applied when possible.

FOR LARGER CHUCK AREAS than shown above, prices on request.

WHEN ORDERING: Specify D.C. Voltage, Power Consumed in Watts, and Holding Area in Square Inches of the Magnetic Chuck.

WHEN BUYING NEW GRINDING MACHINE EQUIPMENT, insist that the machine manufacturer equip them with NEU-T-ROL. These machine manufacturers are thoroughly familiar with NEU-T-ROL and the advantages they offer you.

And you will save TIME and MONEY right at the start
and without having to install NEU-T-ROL at a later date.

Lubricants Recommended for
Surface Grinders, Universal Cutter & Tool Grinders, Drill & Tap Grinders
Manufactured by

GALLMEYER & LIVINGSTON CO.

GRAND RAPIDS, MICH.

as supplied by

GULF OIL CORPORATION

GULF REFINING COMPANY

APPLICATION	HAND FEED SURFACE GRINDERS			HYDRAULIC FEED SURFACE GRINDERS	UNIVERSAL CUTTER AND TOOL GRINDERS				HYDRAULIC FEED UNIVERSAL CUTTER & TOOL GRINDERS		DRILL & TAP GRINDERS
	No. 0	Nos. 15 & 18	No. 20	Models A, F, 25, 28, 35, 36, 38, 38A, 3V, 45, 45A, 55, 55A, 65, 65A	No. 1½	Nos. 3, 4, 5	No. 6	No. 60	Nos. 7 & 8	Nos. 70 & 80	
HYDRAULIC SYSTEM Check daily. Drain and refill every 1000 hrs. operation				GULF HARMONY OIL A Capacities: Models 25, 28, 5 gals. 35, 36, 38, 38A, 3V, 10 gals. 45, 45A, 22 gals. 55, 55A, 65, 65A, 23 gals. Model A, 25 gals. Model F, 50 to 85 gals.					GULF HARMONY OIL A	GULF HARMONY OIL A	
SPINDLE—Oil Lubricated (Ball Bearing) Check level and open oil before starting. Feed 1 drop in 5 minutes.	GULF HARMONY OIL A	GULF HARMONY OIL A		GULF HARMONY OIL A			GULF HARMONY OIL A		GULF HARMONY OIL A		
SPINDLE—Ring Oiled Bearing. Check level monthly. Drain and refill every 1000 hrs. operation.					GULF HARMONY OIL A						GULF HARMONY OIL A
SPINDLE—Wick Lubricated. Check level monthly. Drain and refill every 1000 hrs. operation.						GULF HARMONY OIL A					
SPINDLE—Grease Lubricated. Greased at assembly for life.			No Lubricant Required		No Lubricant Required			No Lubricant Required		No Lubricant Required	
BIJUR ONE-SHOT SYSTEM— Operate pump every 4 hrs. of operation. Check level regularly.			GULF SECURITY OIL H	GULF SECURITY OIL H				GULF SECURITY OIL H		GULF SECURITY OIL H	
HAND OILING—Oil Cups. Fill every 4 hrs. of operation.	GULF SECURITY OIL H	GULF SECURITY OIL H			GULF SECURITY OIL H	GULF SECURITY OIL H	GULF SECURITY OIL H		GULF SECURITY OIL H		GULF SECURITY OIL H
WAYS—Oil Pockets— Oil daily.	GULF SECURITY OIL H	GULF SECURITY OIL H		Models A & F Tables from Hyd. System. Others from Bijur		GULF SECURITY OIL H	GULF SECURITY OIL H		GULF SECURITY OIL H		
MOTORS: See motor mfr. instructions.	Oil Lubricated	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A	GULF HARMONY OIL A
	Grease Lubr.		GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2	GULF PRECISION GREASE #2

GALLMEYER & LIVINGSTON CO.

GRAND RAPIDS, MICH.

Lubricants Recommended by SINCLAIR REFINING COMPANY

for

Surface Grinders, Universal Cutter & Tool Grinders, Drill & Tap Grinders

APPLICATION	HAND FEED SURFACE GRINDERS			HYDRAULIC FEED SURFACE GRINDERS	UNIVERSAL CUTTER AND TOOL GRINDERS				HYDRAULIC FEED UNIVERSAL CUTTER & TOOL GRINDERS		DRILL & TAP GRINDERS	
	No. 0	Nos. 15 & 18	No. 20	Models A, F, 25, 28, 35, 36, 38, 38A, 3V, 45, 45A, 55, 55A, 65, 65A	No. 1 1/2	Nos. 3, 4, 5	No. 6	No. 60	Nos. 7 & 8	Nos. 70 & 80		
HYDRAULIC SYSTEM Check daily. Drain and refill every 1000 hrs. operation	...	...	...	Rubilene Extra Light Capacities: Models 25, 28, . . . 5 gals. 35, 36, 38, 38A, 3V, . . . 10 gals. 45, 45A, . . . 22 gals. 55, 55A, 65, 65A, . . . 23 gals. Model A, . . . 25 gals. Model F, . . . 50 to 85 gals.	...	...	...	...	Rubilene Extra Light	Rubilene Extra Light	...	...
SPINDLE—Oil Lubricated (Ball Bearing) Check level and open oil before starting. Feed 1 drop in 5 minutes.	Rubilene Extra Light	Rubilene Extra Light	...	Rubilene Extra Light	...	...	Rubilene Extra Light	...	Rubilene Extra Light	...	...	...
SPINDLE—Ring Oiled Bearing. Check level monthly. Drain and refill every 1000 hrs. operation.	...	...	...	...	Rubilene Extra Light	...	...	...	...	...	Rubilene Extra Light	...
SPINDLE—Wick Lubricated. Check level monthly. Drain and refill every 1000 hrs. operation.	...	...	...	...	...	Rubilene Extra Light	...	...	...	...	...	...
SPINDLE—Grease Lubricated. Greased at assembly for life.	...	...	No Lubricant Required	...	No Lubricant Required	...	...	No Lubricant Required	...	No Lubricant Required	...	...
BIJUR ONE-SHOT SYSTEM— Operate pump every 4 hrs. of operation. Check level regularly.	...	...	Rubilene Light Medium	Rubilene Light Medium	...	...	...	Rubilene MX	...	Rubilene MX	...	...
HAND OILING—Oil Cups. Fill every 4 hrs. of operation.	Rubilene Light Medium	Rubilene Light Medium	...	...	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	...	Rubilene Light Medium	...	Rubilene Light Medium	...
WAYS—Oil Pockets— Oil daily.	Table	Rubilene Light Medium	Rubilene Light Medium	...	Models A & F Tables from Hyd. System. Others from Bijur	...	Rubilene MX	Rubilene MX	...	...	...	...
	Crossways	...	...	...	...	...	Rubilene MX	Rubilene MX	...	Rubilene MX	...	...
MOTORS: See motor mfr. instructions.	Oil Lubricated	Rubilene Light Medium	...	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium	Rubilene Light Medium
	Grease Lubr.	...	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2	AF Bearing Grease #2

SINCLAIR REFINING COMPANY

630 FIFTH AVENUE

NEW YORK 20, N. Y.

ATLANTA 1, GA.
573 West Peachtree Street, N. E.
CHICAGO 8, ILL.
2540 West Cermak Road

District Offices
NEW YORK 20, N. Y.
10 West 51st Street

FORT WORTH 2, TEX.
307 West 7th Street
KANSAS CITY 13, MO.
907 Grand Avenue



LUBRICANTS RECOMMENDED
by
STANDARD OIL COMPANY (IND.)
for
EQUIPMENT MANUFACTURED BY
GALLMEYER & LIVINGSTON COMPANY
GRAND RAPIDS, MICHIGAN



Page 1.

PART		INSTRUCTIONS	LUBRICANT
HAND FEED SURFACE GRINDERS - MODELS O, 15.			
Spindle	Oil Lubricated	Open shut-off on oiler before starting wheel. Fill oil cup every shift. Feed about 1 drop in 5 minutes.	Stanoil No.15
	Grease Lubricated	Bearings are grease packed at assembly for life of bearings	None Required
Gits Oilers		Fill every four hours of operation	Stanoil No.25 or 31
Table Way Oil Pockets		No. 0 - Lift off table and fill pockets daily No.15 - Fill reservoir on front of saddle daily	Stanoil No.25 or 31
PRECISION SURFACE GRINDERS Models 20, 25, 28, 35, 36, 38, 38A, 45, 45A, 55, 55A, 65, 65A - Models A. & F.			
Hydraulic System (All but No.20)		Check oil level daily or every 8 hour shift. Drain and refill system every 1000 hours of operation.	Stanoil No.15
Spindle	Oil Lubricated	Open shut-off on oiler before starting wheel. Fill oil cup every shift. Feed about 1 drop in 5 minutes.	Stanoil No.15
	Grease Lubricated	Bearings are grease packed at assembly for life of bearings.	None Required
Bijur System		Operate pump at regular 4 hour intervals. Check oil level in lubricator regularly and refill whenever three-quarters empty.	Stanoil No.25 or 31
4-22-47			

The services of an experienced Lubrication Engineer to assist you on any lubrication problem, may be obtained without obligation by writing or telephoning to the nearest Standard Oil Company (Indiana) office listed below:

Billings, Montana
Chicago, Illinois
Decatur, Illinois
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Duluth, Minnesota

Evansville, Indiana
Fargo, North Dakota
Grand Rapids, Michigan
Green Bay, Wisconsin
Huron, South Dakota
Indianapolis, Indiana
Joliet, Illinois

Kansas City, Missouri
LaCrosse, Wisconsin
Mankato, Minnesota
Mason City, Iowa
Milwaukee, Wisconsin
Minneapolis, Minnesota
Omaha, Nebraska

Peoria, Illinois
Saginaw, Michigan
St. Joseph, Missouri
St. Louis, Missouri
South Bend, Indiana
Wichita, Kansas



LUBRICANTS RECOMMENDED
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GRAND RAPIDS, MICHIGAN



Page 2.

PART		INSTRUCTIONS	LUBRICANT
PRECISION CUTTER, TOOL AND UNIVERSAL GRINDERS - MODELS 1½, 4, 5, 60, 70, 80			
Hydraulic System (Models 70 & 80 only)		Check oil level daily or every 8 hour shift. Drain and refill system every 1000 hours of operation	Stanoil No.15
Spindle	Ring or Wick Oil Lubricated (Bronze Bearing)	Check level monthly. Drain and refill every 1000 hours of operation	Stanoil No.15
	Oil Lubricated (Ball Bearing)	Open shut-off on oiler before starting wheel. Fill oil cup every shift. Feed about 1 drop in 5 minutes	Stanoil No.15
	Grease Lubricated (Ball Bearing)	Bearings are grease packed at assembly for life of bearings.	None Required
Bijur System (Models 60, 70, 80 only)		Operate pump at regular 4 hour intervals. Check oil level in lubricator regularly and refill whenever three-quarters empty.	Stanolex Oil No.51
Gits Oilers		Fill every 4 hours of operation.	Stanoil No.25 or 31
Table Ways		Model 1½ - Fill Gits Oilers daily Models 4,5 - Fill pockets daily thru oilers in end guards Models 60,70,80 - Fed from Bijur System	Stanolex Oil No.51
DRILL, TAP AND COMBINATION GRINDERS			
Spindle	Ring Oil Lubricated (Bronze Bearing)	Check level monthly. Drain and refill every 1000 hours of operation.	Stanoil No.15
	Oil Lubricated (Ball Bearing)	Oil every 8 hours of operation.	Stanoil No.15
	Grease Lubricated (Ball Bearing)	Bearings are grease packed at assembly for life of bearings.	None Required
Gits Oilers and Hand Oiled Points		Fill every 4 hours of operation	Stanoil No.25 or 31

4-22-47

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Billings, Montana
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Des Moines, Iowa
Detroit, Michigan
Duluth, Minnesota

Evansville, Indiana
Fargo, North Dakota
Grand Rapids, Michigan
Green Bay, Wisconsin
Huron, South Dakota
Indianapolis, Indiana
Joliet, Illinois

Kansas City, Missouri
LaCrosse, Wisconsin
Mankato, Minnesota
Mason City, Iowa
Milwaukee, Wisconsin
Minneapolis, Minnesota
Omaha, Nebraska

Peoria, Illinois
Saginaw, Michigan
St. Joseph, Missouri
St. Louis, Missouri
South Bend, Indiana
Wichita, Kansas



SUN OIL COMPANY

LUBRICATION CHART

for Equipment Manufactured by

GALLMEYER & LIVINGSTON CO.

GRAND RAPIDS, MICH.



PART		INSTRUCTIONS	LUBRICANT
HAND FEED SURFACE GRINDERS—MODELS 0, 15			
Spindle		Open shut-off on oiler before starting wheel. Fill oil cup every shift. Feed about 1 drop in 5 minutes.	Solnus Light
Gits Oilers		Fill every 4 hours of operation.	Sunoco Way Lubricant
Table Way Oil Pockets		No. 0—Lift off table and fill pockets daily. No. 15—Fill reservoir on front of saddle daily.	Sunoco Way Lubricant
PRECISION SURFACE GRINDERS—MODELS 20, 25, 28, 35, 36, 38, 38-A, 45, 45-A, 55, 55-A, 65, 65-A—MODELS A. & F.			
Hydraulic System (All but No. 20)		Check oil level daily or every 8-hour shift. Drain and refill system every 1000 hours of operation.	Solnus Light
Spindle		Open shut-off on oiler before starting wheel. Fill oil cup every shift. Feed about 1 drop in 5 minutes.	Solnus Light
Bijur System		Operate pump at regular 4-hour intervals. Check oil level in lubricator regularly and refill whenever three-quarters empty.	Sunoco Way Lubricant
PRECISION CUTTER, TOOL AND UNIVERSAL GRINDERS—MODELS 1½, 3, 4, 5, 60, 70, 80			
Hydraulic System Models 70 and 80		Check oil level daily or every 8-hour shift. Drain and refill system every 1000 hours of operation.	Solnus Light
Spindle	Oil Lubricated	Open shut-off on oiler before starting wheel. Fill oil cups every shift. Feed about 1 drop in 5 minutes.	Solnus Light
	Grease Lubricated	Bearings are grease packed at assembly for life of bearings.	None
Gits Oilers		Fill every 4 hours of operation.	Sunoco Way Lubricant
Table Way Oil Pockets		Fill every 8-hour shift.	
DRILL AND TAP GRINDERS			
Spindle		Check level in ring oiled bearings once monthly. Drain and refill bearings every six months.	Solnus Light
Gits Oilers and Hand Oiled Points		Fill every 4 hours of operation.	Solnus Light

THE TEXAS COMPANY
LUBRICATION CHART
For Grinders Manufactured By
GALLMEYER & LIVINGSTON CO., GRAND RAPIDS, MICH.

PAGE 1

Part		Instructions	Lubricant
HAND FEED SURFACE GRINDERS - MODELS 0, 15, 18			
SPINDLE	OIL LUBRICATED	OPEN SHUT-OFF ON OILER BEFORE STARTING WHEEL. FILL OIL CUP EVERY SHIFT. FEED ABOUT ONE DROP IN 5 MINUTES.	TEXACO REGAL OIL A (R&O)
	GREASE LUBRICATED	BEARINGS PACKED, AT ASSEMBLY, FOR LIFE OF BEARINGS.	NONE REQUIRED
GITS OILERS		FILL EVERY FOUR HOURS OF OPERATION.	TEXACO URSA OIL P-30
TABLE WAY OIL POCKETS		No. 0. - LIFT OFF TABLE AND FILL POCKETS DAILY. No. 15. - FILL RESERVOIR ON FRONT OF SADDLE DAILY. No. 18. - FILL POCKETS DAILY.	TEXACO URSA OIL P-30
PRECISION SURFACE GRINDERS MODELS 20, 25, 28, 35, 36, 38, 38A, 3V, 45, 45A, 55, 55A, 65, 65A - MODELS A & F			
HYDRAULIC SYSTEM (ALL BUT NO. 20.)		CHECK OIL LEVEL DAILY OR EVERY 8 HOUR SHIFT. DRAIN AND REFILL SYSTEM EVERY 1000 HOURS OF OPERATION.	TEXACO REGAL OIL A (R&O)
SPINDLE	OIL LUBRICATED	OPEN SHUT-OFF ON OILER BEFORE STARTING WHEEL. FILL OIL CUP EVERY SHIFT. FEED ONE DROP IN 5 MINUTES.	TEXACO REGAL OIL A (R&O)
	GREASE LUBRICATED	BEARINGS PACKED, AT ASSEMBLY, FOR LIFE OF BEARINGS.	NONE REQUIRED
BIJUR SYSTEM		OPERATE PUMP AT REGULAR 4 HOUR INTERVALS. CHECK OIL LEVEL IN LUBRICATOR REGULARLY AND REFILL WHENEVER THREE-QUARTERS EMPTY.	TEXACO URSA OIL P-30
PRECISION CUTTER, TOOL AND UNIVERSAL GRINDERS MODELS 1½, 10, 4, 5, 6, 60, 7, 70, 8, 80			
HYDRAULIC SYSTEM (MODELS 7, 70, 8, 80, ONLY)		CHECK OIL LEVEL DAILY OR EVERY 8 HOUR SHIFT. DRAIN AND REFILL SYSTEM EVERY 1000 HOURS OF OPERATION.	TEXACO REGAL OIL A (R&O)
SPINDLE	RING OR WICK OIL LUB. (BRONZE BEARING)	CHECK LEVEL MONTHLY. DRAIN AND REFILL EVERY 1000 HOURS OF OPERATION.	TEXACO REGAL OIL A (R&O)
	OIL LUBRICATED (BALL BEARING)	OPEN SHUT-OFF ON OILER BEFORE STARTING WHEEL. FILL OIL CUP EVERY SHIFT. FEED ABOUT ONE DROP EVERY 5 MINUTES.	TEXACO REGAL OIL A (R&O)
	GREASE LUBRICATED (BALL BEARING)	BEARINGS ARE GREASE PACKED, AT ASSEMBLY, FOR LIFE OF BEARINGS.	NONE REQUIRED

THE TEXAS COMPANY
LUBRICATION CHART
For Grinders Manufactured By
GALLMEYER & LIVINGSTON CO., GRAND RAPIDS, MICH.

PAGE 2

Part		Instructions	Lubricant
BIJUR SYSTEM (MODELS 60,70,80 ONLY)		OPERATE PUMP AT REGULAR 4 HOUR INTERVALS. CHECK OIL LEVEL IN LUBRICATOR REGULARLY AND REFILL WHENEVER BELOW OIL WINDOW LEVEL.	TEXACO URSA OIL P-30
GITS OILERS		FILL EVERY FOUR HOURS OF OPERATION.	TEXACO URSA OIL P-30
TABLE WAYS		MODEL 1½ -- FILL GITS OILERS DAILY. MODEL 10 - FILL RESERVOIR ON FRONT OF BASE DAILY. MODELS 4, 5 - FILL RESERVOIR ON FRONT OF SADDLE DAILY MODELS 6, 7, 8 - NONE REQUIRED. MODELS 60, 70, 80 - FED FROM BIJUR SYSTEM	TEXACO URSA OIL P-30
DRILL, TAP AND COMBINATION GRINDERS			
SPINDLE	RING OIL LUBRICATED (BRONZE BEARING)	CHECK LEVEL MONTHLY. DRAIN AND REFILL EVERY 1000 HOURS OF OPERATION.	TEXACO REGAL OIL A (R&O)
	OIL LUBRICATED (BALL BEARINGS)	OIL EVERY 8 HOURS OF OPERATION.	TEXACO REGAL OIL A (R&O)
	GREASE LUBRICATED (BALL BEARINGS)	BEARINGS ARE PACKED, AT ASSEMBLY, FOR LIFE OF BEARINGS.	NONE REQUIRED
GITS OILERS AND HAND OILED POINTS		FILL EVERY 4 HOURS OF OPERATION.	TEXACO URSA OIL P-30

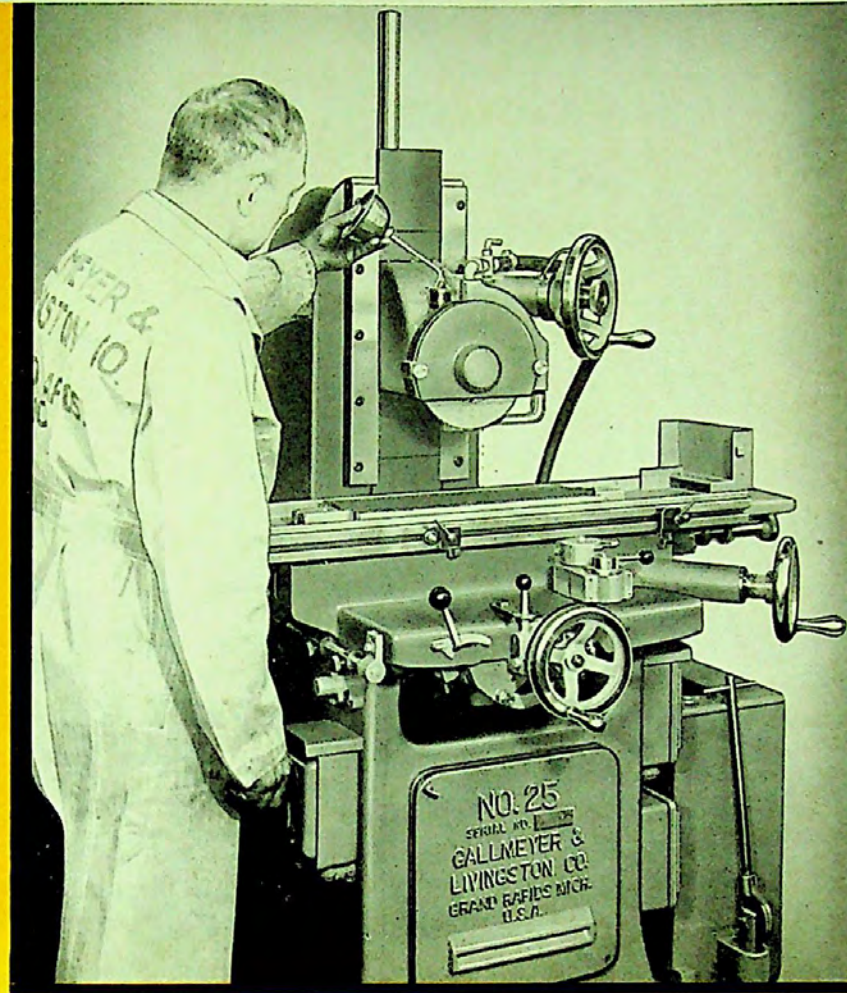
This chart revised 11/1/48

GRAND RAPIDS GRINDERS

Manufactured

by

GALLMEYER & LIVINGSTON CO.
GRAND RAPIDS, MICHIGAN



*Proper Lubrication Will Protect the Efficiency and Accuracy of Your **GRAND RAPIDS GRINDERS***

TO some the above statement may seem exaggerated and fundamentally open to question. However, if we consider further and gain a true understanding of lubrication in relation to grinder operation, we can see that the statement is really conservative. In fact, it can be amplified to include other phases of operation such as power consumption, service life, depreciation and maintenance. Conversely, it should be realized that improper lubrication will penalize performance in a very definite way. The degree to which lubrication is neglected will ultimately cause a corresponding lowering in the service and satisfaction enjoyed.

The fundamental action of lubrication is to replace mechanical friction with fluid friction and so gain the benefits of smooth, free motion. In actual practice it is never possible to completely eliminate mechanical friction but the extent to which this result is continuously realized determines in general the effectiveness of lubrication. Generally speaking, the problem of proper lubrication becomes largely a matter of having the right lubricant, in the right place and in the right quantity at all times. Design of the lubrication system obviously assumes an important part in achieving this result. The engineering staff of Gallmeyer & Livingston have given this feature their unceasing attention. We take pardonable pride in saying that the oiling methods installed on Grand Rapids grinders have been made as simple, automatic and fool-proof as will be found on any present-day line of machine tools.

It is impossible, however, to devise any practical system which does not require some degree of care and attention. Although we have intentionally made the effort needed as small as possible, it is nevertheless highly essential that this be of the right sort and on a regular systematized basis. The contents of this bulletin are largely devoted to this subject and we urge that they be given close study and faithful adherence. The reward will be well worth all labor expended.

The hydraulic actuation of feeds and table travel as developed and employed on Grand Rapids grinders offers the ultimate in efficient transmission of power and motion. The hydraulic fluid medium serves both to transmit force and to lubricate. Moving parts are submerged in oil and friction losses are at the irreducible minimum. Feed rates are unlimited and capable of closest adjustment.

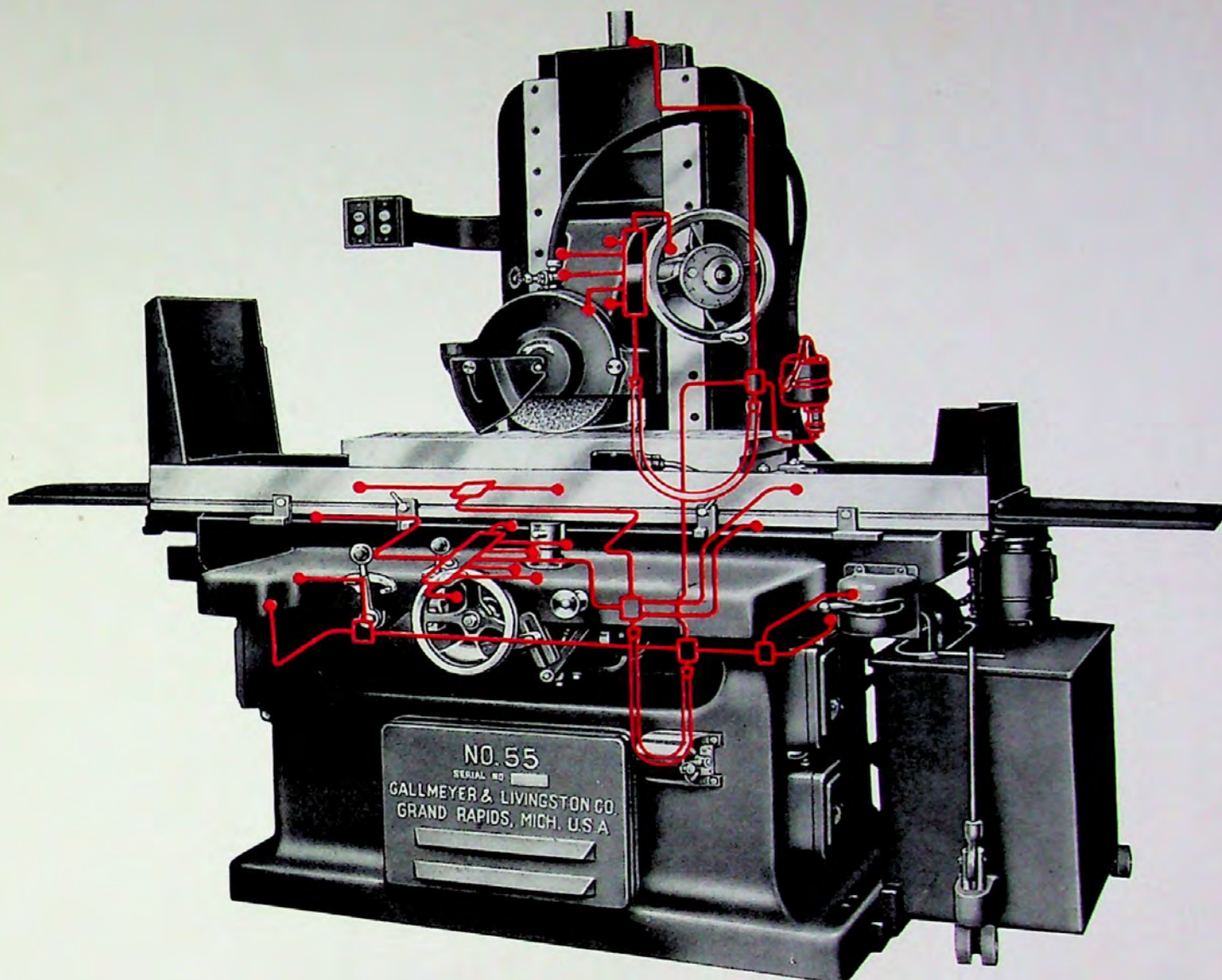
The final link to good lubrication is the lubricant itself — whether it is of the right type and quality. Costs of lubrication should never be judged on the basis of price per gallon. Good oils pay best in the long run. In the Lubrication Chart on page 11, specific brands are listed which can be relied upon to give efficient, dependable lubrication. We urge that either these products or their equivalents be employed on Grand Rapids grinders.

GALLMEYER & LIVINGSTON CO.
Grand Rapids, Mich.

PRACTICE OF LUBRICATION

The following items of general lubrication practice may often spell the difference between success and failure in arriving at the desired outcome. Regularity or 'system' is beyond doubt one of the most important. The need for this becomes readily apparent if we

consider that the lubricant is constantly being used up or consumed, in some instances very slowly, in others very rapidly, and unless provision is made for regular replenishment, the parts will become 'starved.' The Grand Rapids line of grinders has been engineered



*No. 55 Grand Rapids Hydraulic Surface Grinder,
showing arrangement of Bijur Oiling System in color.*

to require a minimum of effort in this respect. The Bijur one-shot system of delivering oil to bearings and gears is used on the majority of models. At points designed for hand oiling, Gits oilers are installed which retain a small quantity of lubricant and exclude all grit or dirt.

Training of personnel and setting up a routine which assures regular attention to lubrication as needed, is a factor to which every Grand Rapids user should give due consideration. In many cases the requirements of other machine tools in the plant or shop must be coordinated. A system of records, particularly to cover dates of oil changes and assure

adequate stocks of the required grades, should prove helpful. Specific instructions as to proper intervals and procedure appear in Lubrication Chart and in following sections of this booklet.

Over-lubrication in the thought that if some oil does good more will do better is unsound because the excess will usually run to waste without serving any useful purpose. Likewise the practice of applying greater quantity and lubricating less often is a mistaken idea and may cause the parts to run dry. Furthermore, over-lubrication contributes to a dirty condition of the grinder and adjacent floor surfaces

because of the greater amount of waste lubricant even though the machine may be wiped down frequently.

Cleanliness assumes a significant aspect in the general carry-on of lubrication because foreign matter tends to defeat the very purpose of the lubricant. This is particularly true if matter is gritty or abrasive in nature. Cleanliness in the fullest sense implies the arrival of the lubricant at the point of duty in a pure uncontaminated condition.

Starting with storage methods, we recommend that all supplies of oil and grease be housed in a clean isolated room and not in the open on the shop floor or adjacent to the machine. Containers should be kept tightly closed when not in use. Dispensing equipment

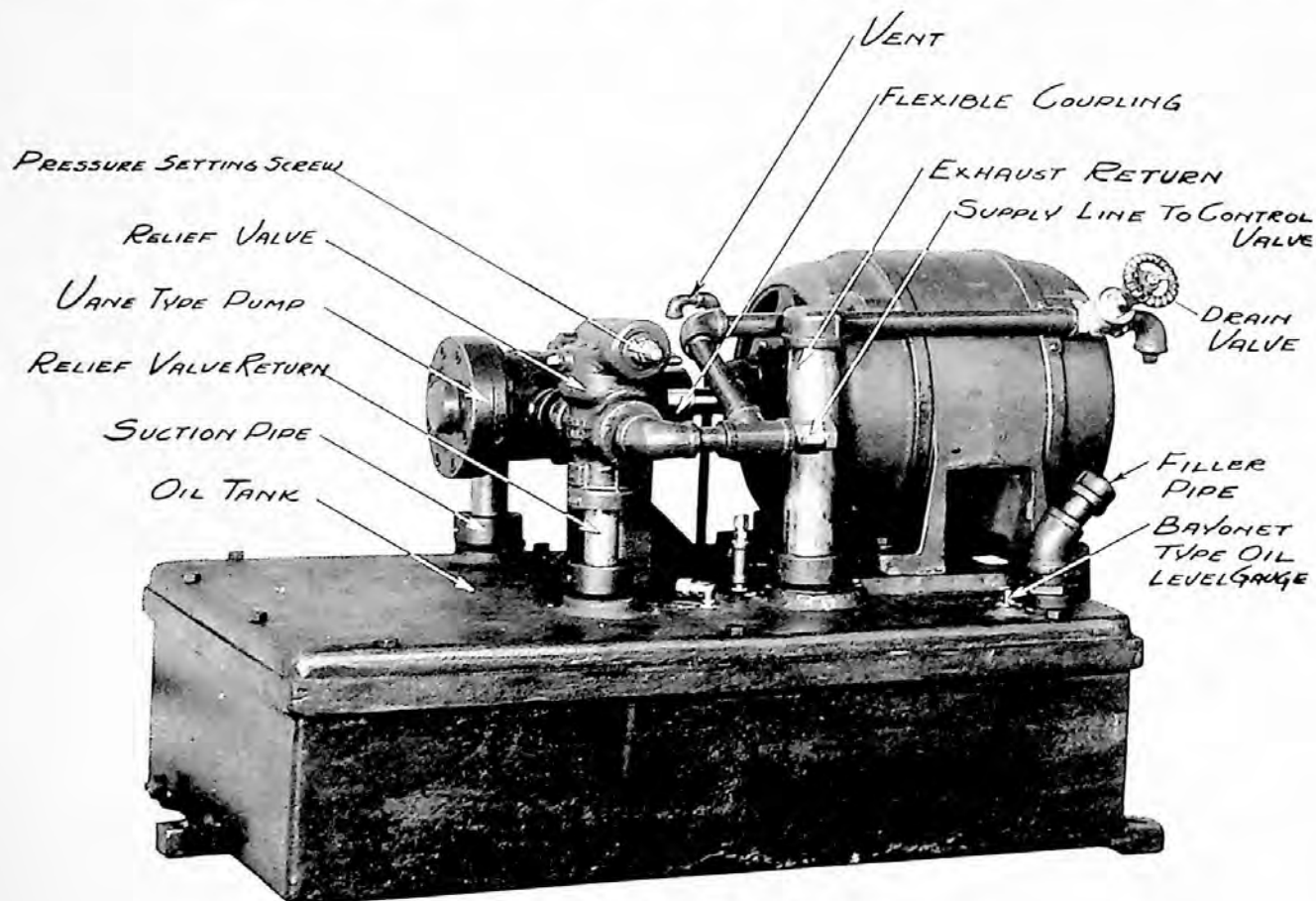
such as oil cans, grease guns, etc., should be maintained in clean, usable condition and immediately stored away after lubrication is completed. All points of introduction such as oil cups, oilers, plugs, caps, etc., should be cleaned free of dirt before lubricant is applied.

All containers and dispensing equipment should be plainly marked or easily identified so that any chance of using the wrong grade is minimized. Equipment having positive action and adjustable delivery per stroke or shot is preferred. For example, an oil can which can be adjusted to deliver any desired number of drops per stroke is recommended in place of the common spring-bottom type.

HYDRAULIC SYSTEM

Design and operating details of the hydraulic system on Grand Rapids Grinders are described at length in our catalogs. It will be sufficient to mention here that a vane type (Vickers) pump driven by

electric motor is used and that pump, motor, oil reservoir and other elements are located in base of grinder. On large machines, a tandem pump is employed. The system is self-contained, fully-enclosed



*Components of Hydraulic System.
Note simplicity, compactness and accessibility.*

and requires only a nominal degree of attention to assure smooth, automatic feeds for long continuous periods. However, it is essential that this attention be on the right basis and we, therefore, urge that the following instructions be carefully observed.

Oil Level

This should be checked at least once daily or every 8 hour shift. A bayonet gauge positioned at top of reservoir is provided for this particular purpose. The depth of oil should be inspected when grinder is idle and hydraulic pump is stopped, otherwise a true reading will not be obtained. Never permit the level to fall below the "low" mark on the gauge as insufficient oil will seriously interfere with proper operation of the system. If pump suction is not fully submerged at all times, air will be drawn into the system and increase compressibility of the fluid medium. Should feeds become jerky or irregular, oil level is one of the first things to investigate.

Too much oil in the system is no advantage and may induce overflow from the vent and filler cap. Therefore, the level should never be raised above the "high" mark with the idea that more oil will give added protection.

When oil is poured into the reservoir, strict precautions should be taken that no dirt or foreign matter is permitted to enter. Simple care in this respect will avoid costly repairs as even small concentrations of grit can cause the pump to burn out and seize. If any doubt exists concerning cleanliness of the oil being introduced, we recommend that it be poured through a fine mesh strainer or filter, although this practice will usually not be necessary. Always replace cap on filler opening as soon as filling is completed.

Draining

Hydraulic oil of good quality can ordinarily be used for 1000 hours of operation, at the end of which period the reservoir should be drained and refilled with fresh oil. A plug in the base is provided for this purpose. Longer service intervals are never advisable and will prove no ultimate economy. Oxidation of the oil gradually takes place as a result of continuous circulation in the presence of air and the oxidized portions build up until an increase in viscosity and loss in lubricating value occurs. Inferior or poorly

refined oils are affected at a more rapid rate and to avoid operating difficulties must be drained at more frequent intervals. For discussion of qualities desired in hydraulic fluid medium, refer to corresponding heading, page 9.

Oil changes should preferably be made after the grinder has been running for a while or the end of a shift. Then impurities will not have an opportunity to settle and will be more thoroughly washed out with the drained oil.

Oil Leaks

Aside from the waste of oil which occurs when a leak develops, this condition may permit air to enter the system and cause irregular operation. All new machines are thoroughly tested in this respect; however, if escape of oil is noted at any point after a period of service, we urge that this be corrected as soon as possible.

Pressure Gauge

On all models of Grand Rapids grinders, a gauge is installed on the delivery side of the pump which indicates the oil pressure being generated. This gauge offers a degree of supervision over operation of system and should be kept under observation. Any decided change or fluctuation from the established normal should be investigated and remedied, otherwise performance will be penalized.

Purolator

On Models A and F a filter is installed in the return from the ways which are automatically lubricated by pressure feed from the hydraulic system. This filter is of the automotive type and must be replaced when it becomes clogged or ceases to function properly.

Hydraulic Capacity Chart

Hydraulic Feed Surface Grinders:

Nos. 25 and 28.....	5 gal.
Nos. 35, 36, 38, 38A, 3V.....	10 gal.
Nos. 45 and 45A.....	22 gal.
Nos. 55, 55A, 65, 65A.....	23 gal.
Model A	25 gal.
Model F	50 to 85 gal.

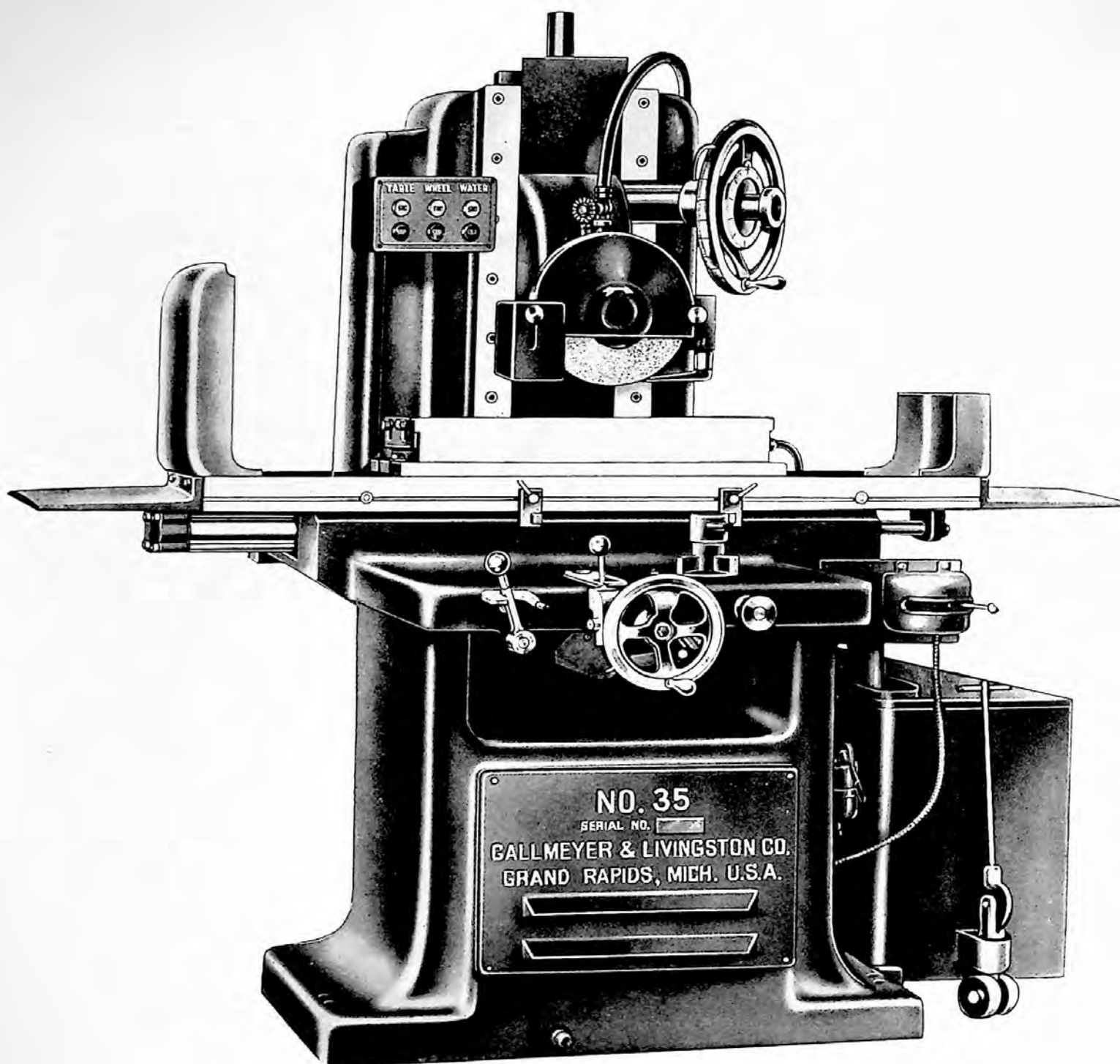
Hydraulic Feed Universal Grinders:

All Models	2 1/4 gal.
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SPINDLE LUBRICATION

The grinder spindle is mounted in special precision preloaded ball bearings or in heavy adjustable plain bronze bearings. The ball bearing mountings are

lubricated by means of a drop feed oil cup or are greased at assembly for the life of the bearings. Plain bronze spindle bearings are equipped with either ring



No. 35 Grand Rapids Hydraulic Surface Grinder

or wick oilers. For data on type of mounting and method of lubrication which is standard for each grinder model refer to Lubrication Chart on page 11.

Where a drop feed oil cup is installed the feed from this cup should be regulated to give a cool run-

ning bearing without waste of oil. In the average case, a rate of one (1) drop in 5 minutes should prove sufficient and is suggested as a basis for trial. The cup must never be allowed to become empty during operation and regular filling, preferably at the begin-

ning of each shift is recommended. A shut-off is provided on the cup which should be turned on a few minutes before the wheel is started up.

When spindles are ring oiled the rings should be examined occasionally to determine if they are turning freely and carrying oil up to the spindle. Level of oil in the bearing wells should be inspected about once monthly. At intervals of six months (1000 operating

hours) we suggest that the bearing wells be drained and refilled with fresh lubricant.

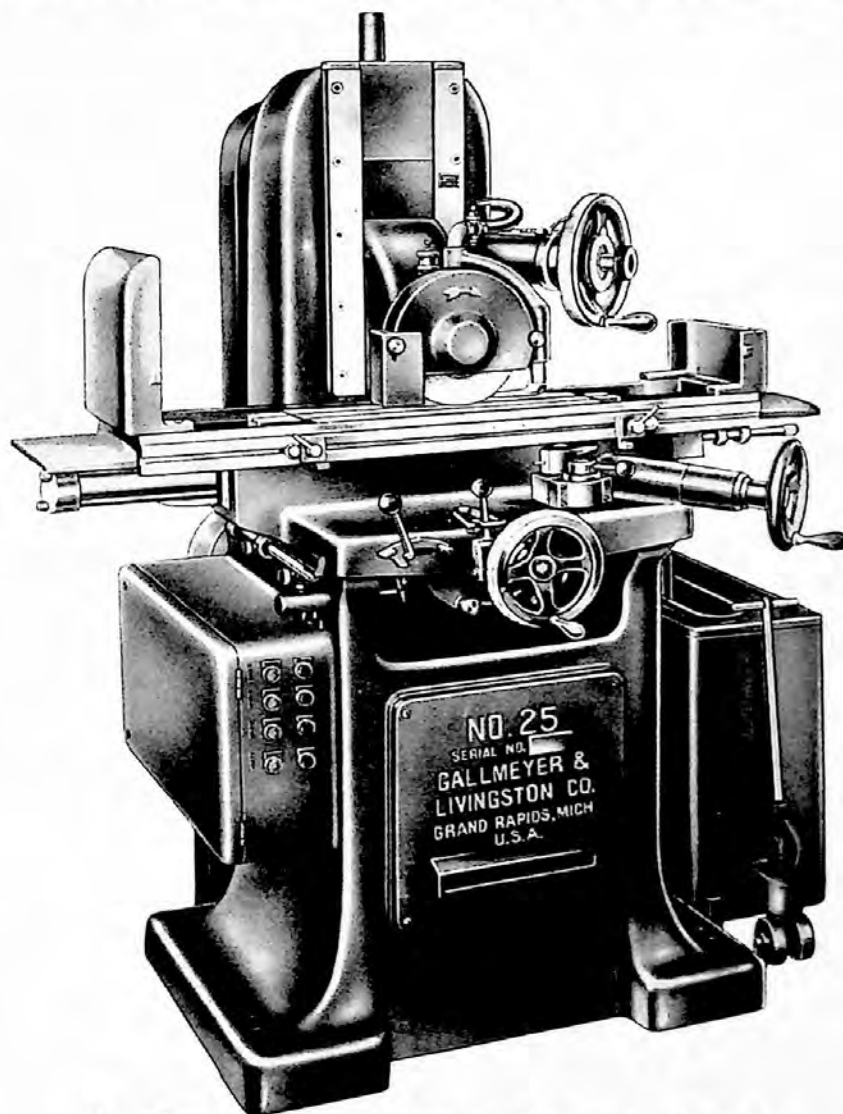
Wick oiled spindles should be checked about once monthly for correct oil level and should be drained and refilled with fresh oil every 1000 hours of operation.

For qualities required in a suitable spindle oil, refer to page 10.

BIJUR SYSTEM

This well-known system of metered pressure oiling is standard on grinder models as indicated on the Lubrication Chart, page 11. It serves to lubricate bearings, ways and other points but not including the table ways on Models A and F grinders which are fed with oil from the hydraulic system. The construc-

tion and operation of the system is described at length in literature issued by the Bijur Lubricating Corp. It is sufficient for our purpose to mention that the system consists in the main of a central hand operated pump with oil reservoir, headers with leads to the individual points, meter units at the points of oil delivery, filter



No. 25 Grand Rapids Hydraulic Surface Grinder

disks in the pump and meter units to assure absolute purity of lubricant, fittings, tubing, etc. See page 3 for illustration of typical layout of system.

Operation is simple, dependable and requires a minimum of effort on the part of the operator. Every four hours of operation, preferably at the beginning and middle of each shift, the handle on the pump should be actuated. This delivers a metered quantity of oil to all points. The oil level in reservoir should be inspected regularly and the reservoir refilled whenever three-quarters of the supply has been used. A sudden descent of the piston after releasing handle indicates reservoir is empty.

A filter disc located at bottom of lubricator protects the lubricating system from chips and dirt. It

is recommended that filter disc be inspected every six months. If not clean, replace disc with a new one.

A suitable grade of clean lubricating oil is essential to efficient functioning of the system. Never use so-called dripless oil or products containing graphite, soap or other foreign substances. For further information in regard to the proper lubricant, refer to "Machine Oil," page 10.

The Bijur system is designed to last the life of the grinder. Of the few difficulties experienced by users, practically all can be traced to one or more of the following causes, namely (1) unsuitable oil, (2) lack of oil in reservoir, (3) failure to actuate the pump. If the simple precautions outlined above are observed, the owner can be assured of continuously effective lubrication.

HAND OILING

Where Gits oilers are installed at points not served by the Bijur system, or on models not so equipped, the essentials to good lubrication are regularity, thoroughness and proper grade of oil. These oilers are small, fool-proof and effectively keep out dirt or coolant. Ordinarily the cups should be filled at *four hour intervals*, preferably at the beginning and middle of each shift. It is important that the operator

or oiler know the location of all lubrication points and that none be neglected. A good grade of machine oil or the same lubricant as used in the Bijur system is suggested for this requirement.

Should the oilers ever be accidentally broken or damaged, we urge that replacement be made immediately. This simple precaution will help to avoid costly wear on parts.

ELECTRIC MOTORS

Motors may be equipped with either ball bearings or plain sleeve bearings as dictated by grinder requirements or customer preference. Instructions for lubrication are issued by the motor manufacturer or appear on plate affixed to housing. If for any reason this information is not available, we offer the following general comments concerning the care of motor bearings.

Ball Bearing

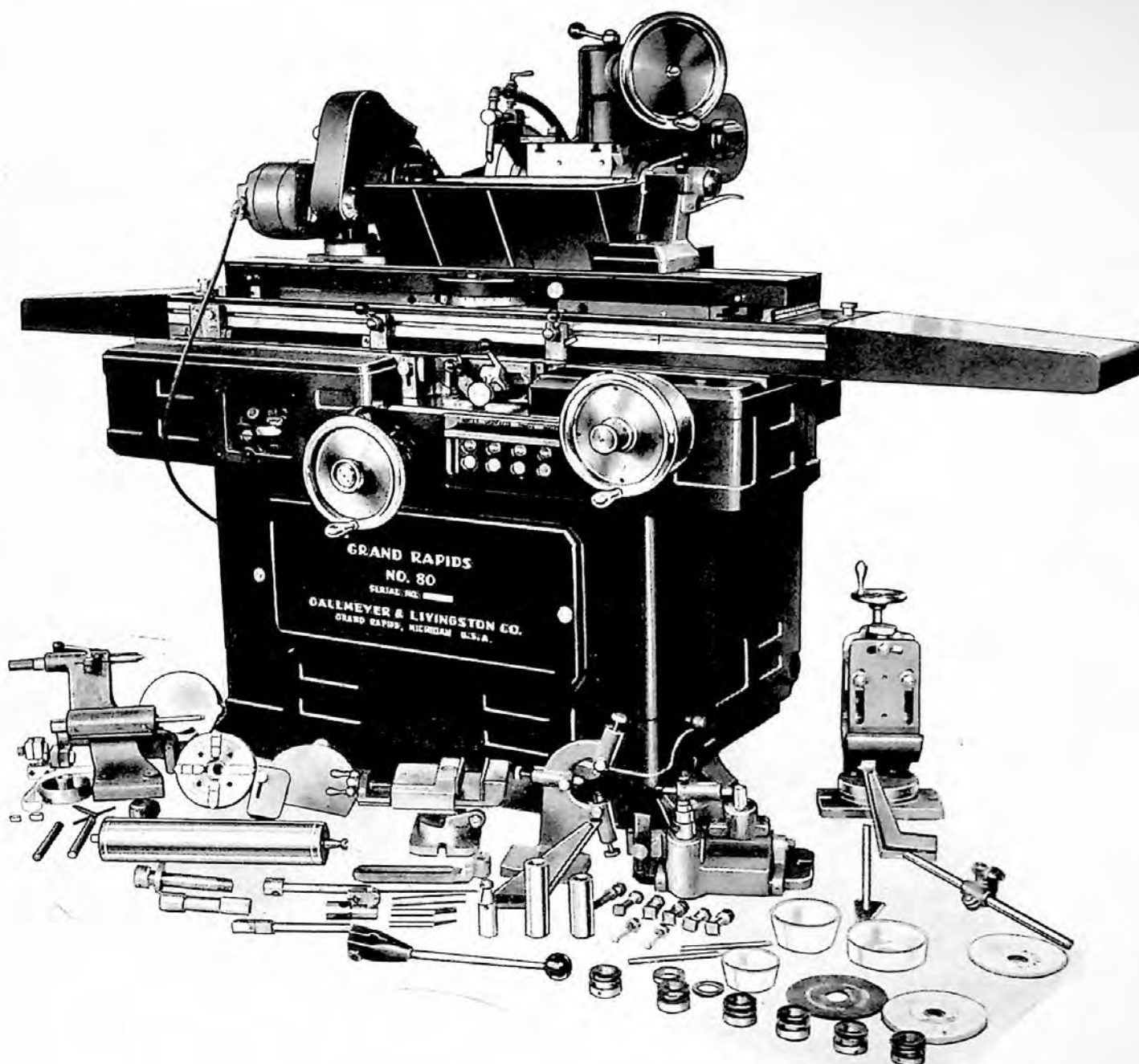
Grease lubrication is commonly employed and plugs or fittings are provided for introducing the lubricant. Bearings should be lubricated sparingly every thousand hours of operation or at least every six months and should never be packed tightly with grease as this practice may cause them to run hot. Cleaning out the old grease whenever possible is always beneficial and helps to promote longest bearing life. Only high quality grease which has been particularly manufactured for use in anti-friction bearings should be employed. Ordinary products are very apt to give difficulty in motor bearings on the score of caking,

corrosion, leakage, etc. Gargoyle Grease BRB No. 3 is a suitable grade for this service.

Plain Bearing

Ring or wick oiling is ordinarily employed on this type of bearing. Ring oiled design should be checked about once every three months and fresh oil added to the bearing wells as needed. The bearings should be completely drained and refilled about once yearly. Wick oiled bearings should be given a few drops of oil once monthly.

Over-lubrication is definitely harmful because a greater amount of waste oil will reach internal parts, such as windings, brushes, commutator, etc., and may seriously impair motor efficiency. For this reason sparing application of oil is always advisable. A good grade of medium bodied oil such as Gargoyle Vacuum Oil Heavy Medium, is recommended for motor bearings. A lubricant which will stand up dependably without gumming, thickening or otherwise deteriorating, is desirable.



*No. 80 Grand Rapids Universal and Tool Grinder
having Hydraulic Actuation of table.*

LUBRICANTS

Hydraulic Fluid Medium

Because of the severe service to which the oil is subjected in the hydraulic system, the grade used should be especially refined for this class of duty. To assure most efficient operation, the oil should pos-

sess high chemical stability and resistance to oxidation or sludge formation, should not vaporize when subjected to sudden changes in pressure, and should release entrained air readily so that foaming does not develop. It should also separate quickly from

water or other impurities without tendency to form persistent emulsions. Equally important is the need for the oil to remain fluid at lower temperatures and not to thin out excessively at high, at the same time having the necessary lubricating properties to suitably protect the pump and other moving parts against excessive wear. Viscosity should be approximately 150 seconds S.U. at 100° F. Gargoyle D.T.E. Oil Light or equal is recommended as a suitable grade meeting the above mentioned requirements. This oil has been found to give superior operation in general when used as the hydraulic fluid medium.

Spindle Lubricant

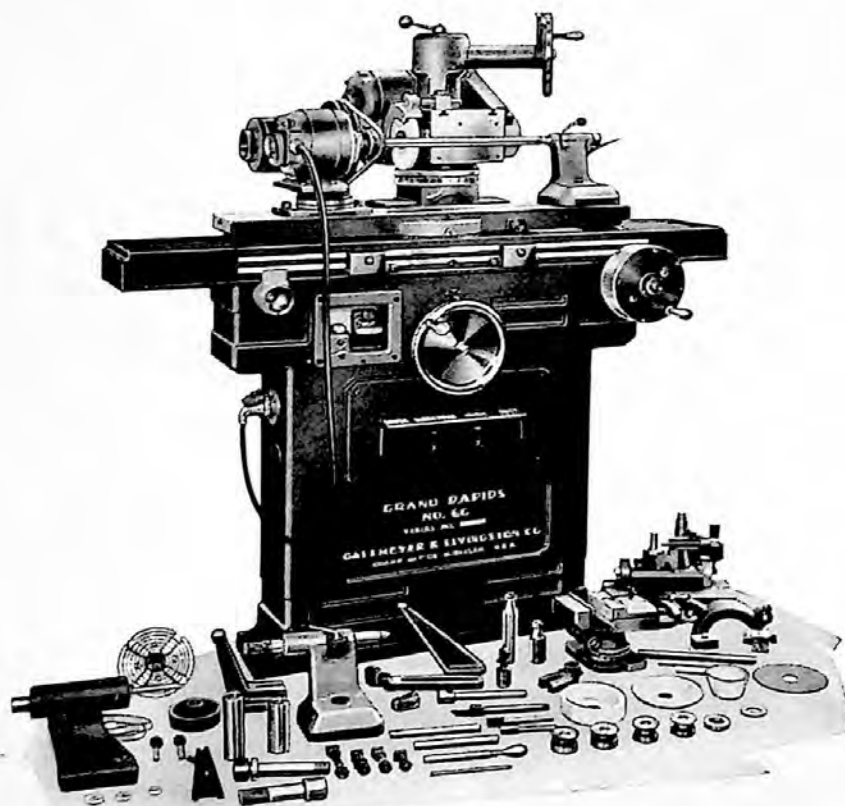
A light bodied oil having good lubricating properties and high chemical stability is recommended for this requirement. Because of high speeds and close clearances involved any tendency to form gum or deposits within the spindle mounting is particularly objectionable. The brand approved for the hydraulic system will also be suitable for spindle lubrication and we suggest that Gargoyle D.T.E. Oil Light or equivalent be employed for this service.

Machine Oil

For the Bijur system on hand feed and hydraulic feed surface grinders and for general hand oiling purposes, a medium bodied machine oil of good quality and high lubricating value is suggested. It is particularly important that the oil be free of any graphite, soap, solids or compounds which may act to clog the filter discs in the Bijur system. Gargoyle Vactra Oil Heavy Medium or equal is recommended as a grade having the properties desired for this class of service and one which will provide dependable lubrication if used as instructed in this booklet.

Way Oil

For most effective oiling of the table and cross-ways on universal cutter and tool grinders also on hydraulic feed universal grinders a special lubricant is advisable which offers a high degree of oiliness and insures smooth jump-free travel of the table. For this particular requirement we suggest Gargoyle Vactra Oil Extra Heavy L or an oil with equivalent properties and especially compounded for lubrication of ways.



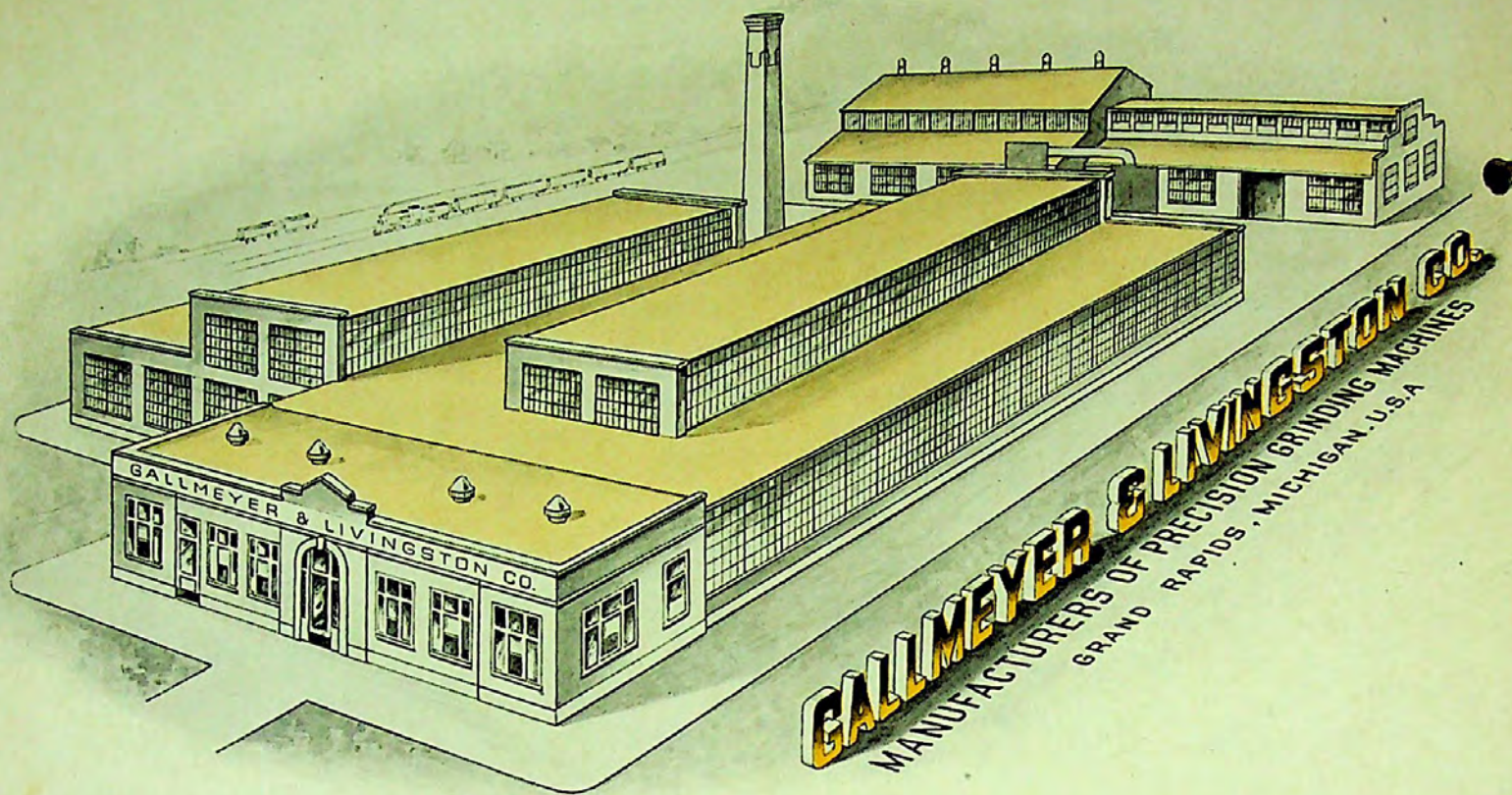
No. 60 Grand Rapids Universal Cutter and Tool Grinder

LUBRICATION CHART *for* GRAND RAPIDS GRINDERS

APPLICATION		HAND FEED SURFACE GRINDERS			HYDRAULIC FEED SURFACE GRINDERS Nos. 25, 28, 35, 36, 38, 38A, 3V, 45, 45A, 55, 55A, 65, 65A, Models A and F	UNIVERSAL CUTTER AND TOOL GRINDERS				HYDRAULIC FEED UNIVERSAL GRINDERS		DRILL AND TAP GRINDERS
		No. 0	Nos. 15 and 18	No. 20		No. 1½	Nos. 3, 4, 5	No. 6	No. 60	Nos. 7 and 8	Nos. 70 and 80	
Hydraulic System Check daily or every 8 hours. Drain and refill every 1000 hours of operation.					Gg. D.T.E. Oil Light					Gg. D.T.E. Oil Light	Gg. D.T.E. Oil Light	
Spindle — Oil Lubricated Ball Bearing Check level and open oiler be- fore starting. Feed one drop in five minutes.		Gg. D.T.E. Oil Light	Gg. D.T.E. Oil Light		Gg. D.T.E. Oil Light			Gg. D.T.E. Oil Light		Gg. D.T.E. Oil Light		
Spindle — Ring Oil Lubricated Check level monthly. Drain and refill every 1000 hours of operation.						Gg. D.T.E. Oil Light						Gg. D.T.E. Oil Light
Spindle — Wick Lubricated Check level monthly. Drain and refill every 1000 hours of operation.							Gg. D.T.E. Oil Light					
Spindle — Grease Lubricated Anti-Friction Greased at assembly for life of bearings.				None Required		None Required			None Required		None Required	
Bijur One-Shot System Operate pump every 4 hours of operation. Check level regularly.				Gg. Vactra Oil Heavy Medium	Gg. Vactra Oil Heavy Medium				Gg. Vactra Oil Extra Heavy L		Gg. Vactra Oil Extra Heavy L	
Hand Oilers Fill every 4 hours of opera- tion.		Gg. Vactra Oil Heavy Medium	Gg. Vactra Oil Heavy Medium			Gg. Vactra Oil Heavy Medium	Gg. Vactra Oil Heavy Medium	Gg. Vactra Oil Heavy Medium		Gg. Vactra Oil Heavy Medium		Gg. Vactra Oil Heavy Medium
Way Oil Pockets Fill daily.	Table	Gg. Vactra Oil Heavy Medium	Gg. Vactra Oil Heavy Medium		Models A and F from hydraulic system. All others from Bijur		Gg. Vactra Oil Extra Heavy L	Gg. Vactra Oil Extra Heavy L		Gg. Vactra Oil Extra Heavy L		
	Crossways						Gg. Vactra Oil Extra Heavy L	Gg. Vactra Oil Extra Heavy L		Gg. Vactra Oil Extra Heavy L		
Motors See motor manufacturers instructions.	Oil Lubricated	Gg. Vacuoline Oil Heavy Medium		Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium	Gg. Vacuoline Oil Heavy Medium
	Grease Lubricated		Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	Gg. Grease BRB No. 3	

NOTE: — Blank space indicates the particular grinder model
does not have such a requirement.

Lubricants specified are made by the Socony-Vacuum Oil Co.
Gg. = Gargoyle



GRAND RAPIDS
SURFACE and TOOL GRINDERS
Engineered and Built
for the
PRECISION NEEDS
of ANY Emergency