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Machine Department, B & S

OPERATION AND MAINTENANCE of the 618 and 818 MICROMASTER Series II SURFACE GRINDING MACHINES

Models
618, 618PH, 618H
818, 818PH, 818H

Brown & Sharpe

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GRINDING MACHINES

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FOREWORD

Brown & Sharpe MICROMASTER Surface Grinding Machines have been designed by the industry's most experienced specialists to provide precision, versatility, efficiency, sensitivity to control and durability to set the standard for cost-saving productivity.

This instruction manual provides the essential information required for installation, setup, operation and maintenance of the 618 and 818 MICROMASTERS. It also describes, in Section I, the optional extra equipment available. These supplementary mechanisms, attachments and accessories further extend MICROMASTER capabilities and permit their adaptation to an unlimited variety of specialized requirements.

Instructions for installation or relocation of the machine are covered in Section A. These directions should be carefully observed to save time, to prevent damage, and to assure that the machine is properly placed and prepared for use.

Setup and operating instructions are contained in Sections B and D. Those responsible for setup will also want to assimilate the information in Section C on the selection and use of grinding wheels. Section F will also be of interest to them, since it shows typical operations on the machines.

Maintenance instructions are provided in Section E, which describes the hydraulic system and spindle drive - Section G, gives instructions for disassembly and reassembly - and Section H, a troubleshooting guide.

Since minor design changes are made periodically by Brown & Sharpe for improved performance, some components of your particular machine may differ in some details from the descriptions in this manual. In such cases, supplementary information will be furnished as needed.

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Brown & Sharpe 618 and 818 MICROMASTER
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INSTALLATION

The following instructions for proper placement and preparation of the machine will insure subsequent operation at its full capabilities for precision performance.

Location

The machine should be installed on a firm, level foundation or floor that provides rigid, vibration-free support. When location is on an upper floor, choose a place where there is maximum structural bracing below it. If it is necessary to locate the machine where some vibration is unavoidable, Isolation Mountings should be used.

Moving the Machine

A fork truck of sufficient capacity to lift the machine is usually available, and this is the most efficient means of transferring it to its chosen location. The base of the MICROMASTER is designed to accomodate the forks. These should be spaced so that, approaching from the left side, one is inserted in the slot at the bottom rear of the machine and the other below the lower front of the machine (see Fig. 1A).

With some trucks, the fork length may be insufficient to extend fully under the machine. If so, the table end guard should be removed and the table moved to the extreme right. Caution: Do not attempt to lift the machine with forks in any other position than those provided.

Lifting with Slings

If a fork lift truck is not available, rope slings may be rigged for raising and moving the machine with a chain lift. Place wood blocks or other protective material between the slings and the machine to prevent strain and damage to any sensitive parts. Caution: Never locate slings under the upright base or the table bed.

Removing Braces

The machine is shipped with a brace holding the upright in position and a block under the spindle motor, inside the upright. These serve for protection during shipment (see Fig. 1A).

Remove the brace and the block after the machine is moved to its selected location.

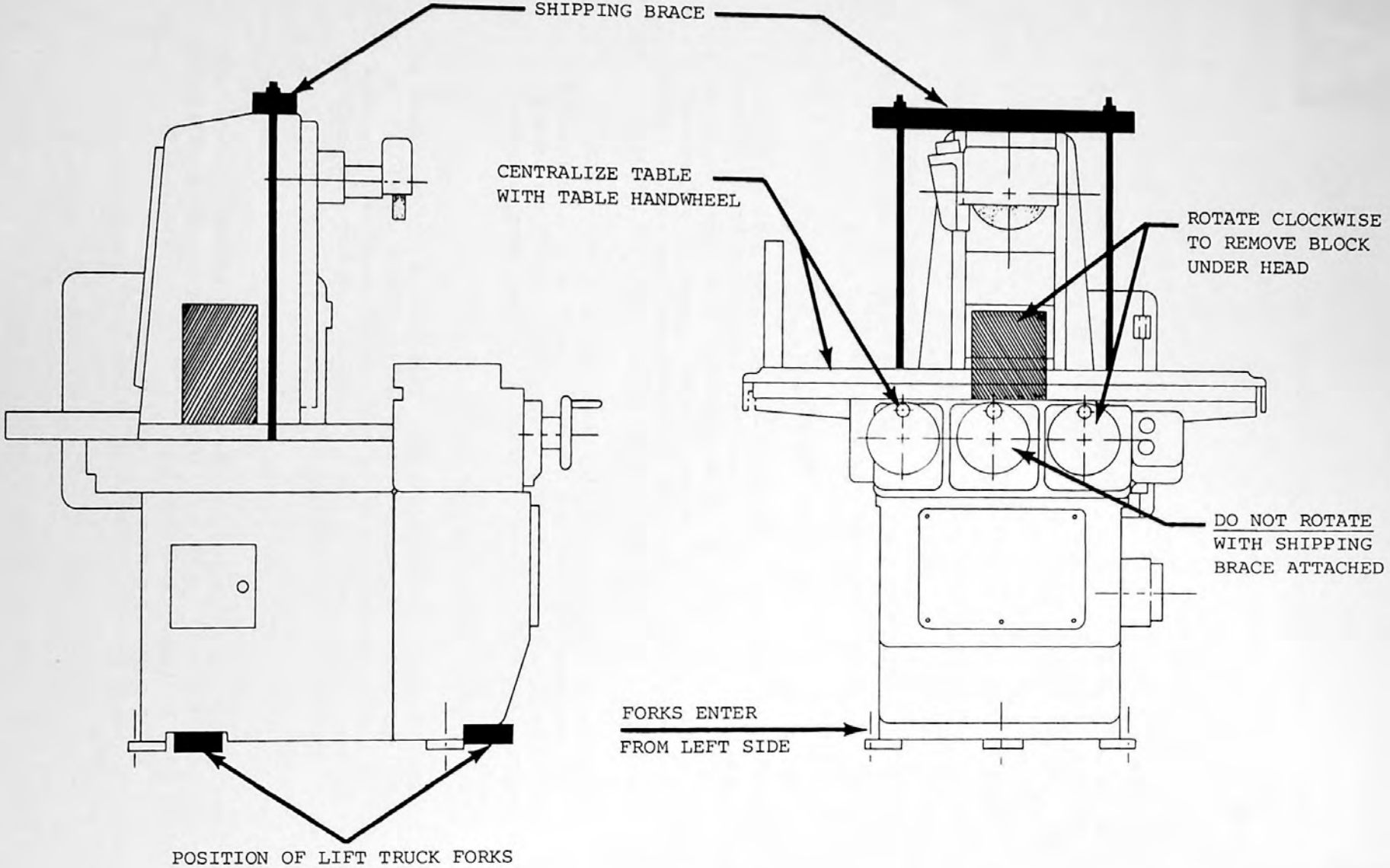

Fig. 1A. Machine arranged for shipment.

It is recommended that the upright brace and block be re-installed at any time the machine is moved to another location. The upright is held to the upright base solely by its own weight. If the upright is lifted or tilted, without the holding brace in position, serious damage could be done to the cross feed screw, elevating splined shaft, and crossfeed piston rod. It is also recommended that the table be securely fastened to the table bed.

Leveling

With the table in centered position, test the surface both longitudinally and transversely with a precision spirit level. Place shims under any machine foot as required to correct the level. Tighten the lag screw, then test the level of the table again, in both directions. Readjust again with shims if necessary.

Connecting to Power Supply

Connecting the machine to the power line, properly grounded, is the next step in installation. The lines from the power source should be connected to the control panel through the hole provided in the back of the cabinet. Specifications for the electrical system are printed on a plate affixed to the control cabinet door.

Checking Motor Rotation

Before operating a newly connected machine, check the direction of motor rotation as follows:

Press the Start button, then immediately press the Stop button. Observe the direction of rotation of the wheel spindle. The spindle should rotate clockwise as seen from the front. If the direction of rotation is counterclockwise, reverse one phase of the power supply. This is done conveniently by transposing two of the wires at the line disconnect switch. Do not change the internal wiring of the machine. The wiring as installed at the factory gives the proper relationship of hydraulic pump motor rotation to spindle motor rotation. Also, both motors have been correctly wired to their respective overload relays.

Filling the Oil Reservoir

The hydraulic system and the lubricating system of the MICROMASTER are served by a common oil reservoir, which must be filled before the machine is operated. Note: It is also advisable to check the reservoir before start-up of any machine that has not been operated for a prolonged period of time.

Open the access door on the left side of the machine and fill the reservoir. Add oil until the level reaches the Full mark on the sight gage located on the same side of the machine (see Fig. 2A). Oil requirements are as follows:

For Hand Feed machines Fill the oil reservoir with approximately 6 gallons (22.7 liters) of high lubricity slide way oil with a vis-

cosity of 150 SUS (32 CST) at 100° F (38° C), which complies to ASLE W-150 standards (recommended, Socony-Mobile Vacuoline #1405).

For Power Feed machines Fill the oil reservoir with approximately 22 gallons (83.3 liters) of "combination hydraulic fluid and slide way lubricant" with a viscosity of 150 SUS (32 CST at 100° F (38° C), which complies with ASLE W-150 standards. (Preferred supplier - Mobile Oil Co. - VACUOLINE No. 1405.)

After filling the new machine reservoir (and after changing the oil at any time) run the pump for about an hour with the table throttle lever in the Off position. This will distribute oil throughout the system and remove air from the hydraulic cylinders. When this run is completed, check the sight gage and add oil as necessary to bring it to the Full level.

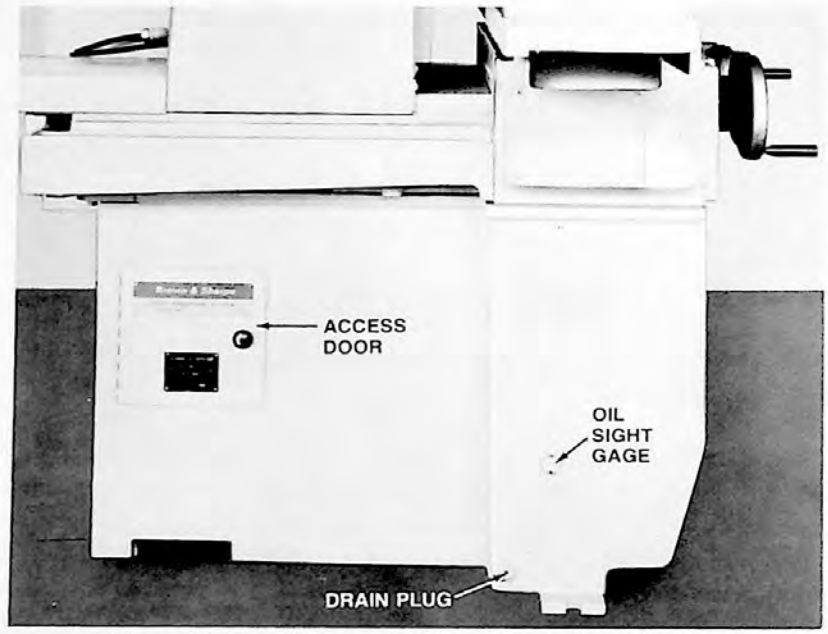

Fig. 2A. Lower left side of machine.

Relocating the Machine

At any time it is necessary to move the machine to a new location in the plant, follow the same directions as for original installation. It is recommended that the upright brace and spindle support block (received with the new machine) be replaced before the machine is moved.

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OPERATING CONTROLS AND INDICATORS

The controls, indicators and other devices necessary for operation of the machine are listed and described below, and are indicated by corresponding numbers on the accompanying illustrations (Figs. 1B, 2B and 3B).

Functions of Controls

1. MACHINE START PUSHBUTTON

On Hand Feed machines - starts spindle motor. On Power Feed machines - starts spindle motor and the motor for the hydraulic pump that pressurizes the hydraulic and lubrication systems.

2. MACHINE STOP PUSHBUTTON

Stops all machine operations at end of work period. Also serves as emergency stop.

3. ELEVATING HANDWHEEL

Rotation of this handwheel counterclockwise feeds the spindle down .050" (1 mm) per revolution. The handwheel has an adjustable dial graduated to read to .0002" (.005 mm).

4. INDICATOR RING CLAMP

For clamping the handwheel (3) adjustable dial in set position.

5. FINE FEED DIAL

Clockwise rotation of this dial feeds the spindle down. The dial is graduated to read to .0001" (.002mm).

6. FINE FEED LOCK

A clockwise turn engages the Fine Feed Dial (5). When unclamped, the fine feed dial is inoperative, and spindle feed is accomplished with the Elevating Handwheel (3).

7. CROSS FEED DIRECTION LEVER

A three position control, with the center position neutral. Pulling the lever forward moves the upright forward hydraulically. Pushing the lever back moves upright in reverse direction.

8. CROSS FEED AMOUNT KNOB

Rotate counterclockwise to increase the pick-feed of the upright from .010" (.254 mm) to .250" (6.35 mm) per pick.

9. CROSS FEED MODE (3-position selector)

Truing position - Provides a fine upright feed, 10" per min. (254 mm/min.). The Cross Feed Direction Lever (7) selects the direction. Used for Truing the wheel from the table. There is a mechanical interlock to prevent hydraulic table movement in this position.

Grinding position - In this position, the upright will feed at each table reversal when the Cross Feed Direction Lever (7) selects the direction.

Rapid traverse position - The upright rapid traverse rate is 12 fpm (3.6m/min) and will operate when the direction is selected by use of the Cross Feed Lever (7). A mechanical interlock prevents hydraulic table movement in this position.

10. CROSS FEED HANDWHEEL

Rotation of this handwheel clockwise feeds the upright forward .100" (2.54 mm) per revolution. The handwheel has an adjustable dial with a dual set of numerals on the graduations. The inner set of numerals read 0 to .100" (2.54 mm) in the clockwise direction. These numerals are used when grinding from front to back. The outer set of numerals read 0 to .100" (2.54 mm) in the counterclockwise direction. These numerals are used when grinding from back to front. Both sets of numerals are used when slot or side wheel grinding.

11. INDICATOR RING CLAMP

For clamping the Cross Feed adjustable dial (10) in set position.

12. TABLE HANDWHEEL

One clockwise revolution of the handwheel moves the table to the right 2" (50.8 mm) on Power Feed machines. On Hand Feed machines, the standard travel per revolution is 2 7/8" (73 mm), with 2" (50 mm) optional.

13. REVERSING LEVER

The table direction is reversed, when under power, by moving this lever in the desired direction of travel.

14. TABLE THROTTLE LEVER

This lever is used to start and stop the power table travel and to regulate the table speed. In the Off position (0) all functions must be hand operated. In the middle position (just before the table starts to creep), the table handwheel is disengaged and the power crossfeed can be operated. Between the middle position and the full On position, the lever is used to regulate the table speed at any rate from 5 ft. to 100 ft. per min. (1.5 to 30.5 m/min - 60 cy. or 1.3 to 25.4 m/min - 50 cy.).

15. ADJUSTING BUSHING

When the desired table speed is attained, it can be set by rotating this bushing counterclockwise until it stops against the Throttle Lever.

16. ADJUSTING BUSHING LOCK

Turned clockwise, this locks the adjusting bushing (15). This permits the operator, after turning the table off, to resume operations at the same table speed.

17. TABLE DOG KNOB

This knob releases the two table dogs for adjustment. Each dog reverses the table travel during power feed operation.

18. WHEEL GUARD

This guard houses a built-in exhaust nozzle that must be connected to the Exhaust Attachment or a central exhaust system when dry grinding. The removable cover permits access to the wheel.

WARNING: At completion of wheel mounting, the Wheel Guard and cover shall be in place and all fasteners properly tightened. Never run a wheel without having the guard and its cover in place.

19. HYDRAULIC MOTOR

This 1 hp (.746 kw) motor is directly coupled to a B&S #25 Rotary Gear Pump that supplies pressure to the hydraulic and lubrication systems.

20. DISCONNECT SWITCH

Turns off power to the entire machine. This Switch must be in Off position before the electrical cabinet door can be opened.

21. LUBRICATION FILTER DOOR

Access door to the Lubrication Filter and Hydraulic Pump. On some machines, the By-pass Filter (F, Fig. 3E) is also located behind this door.

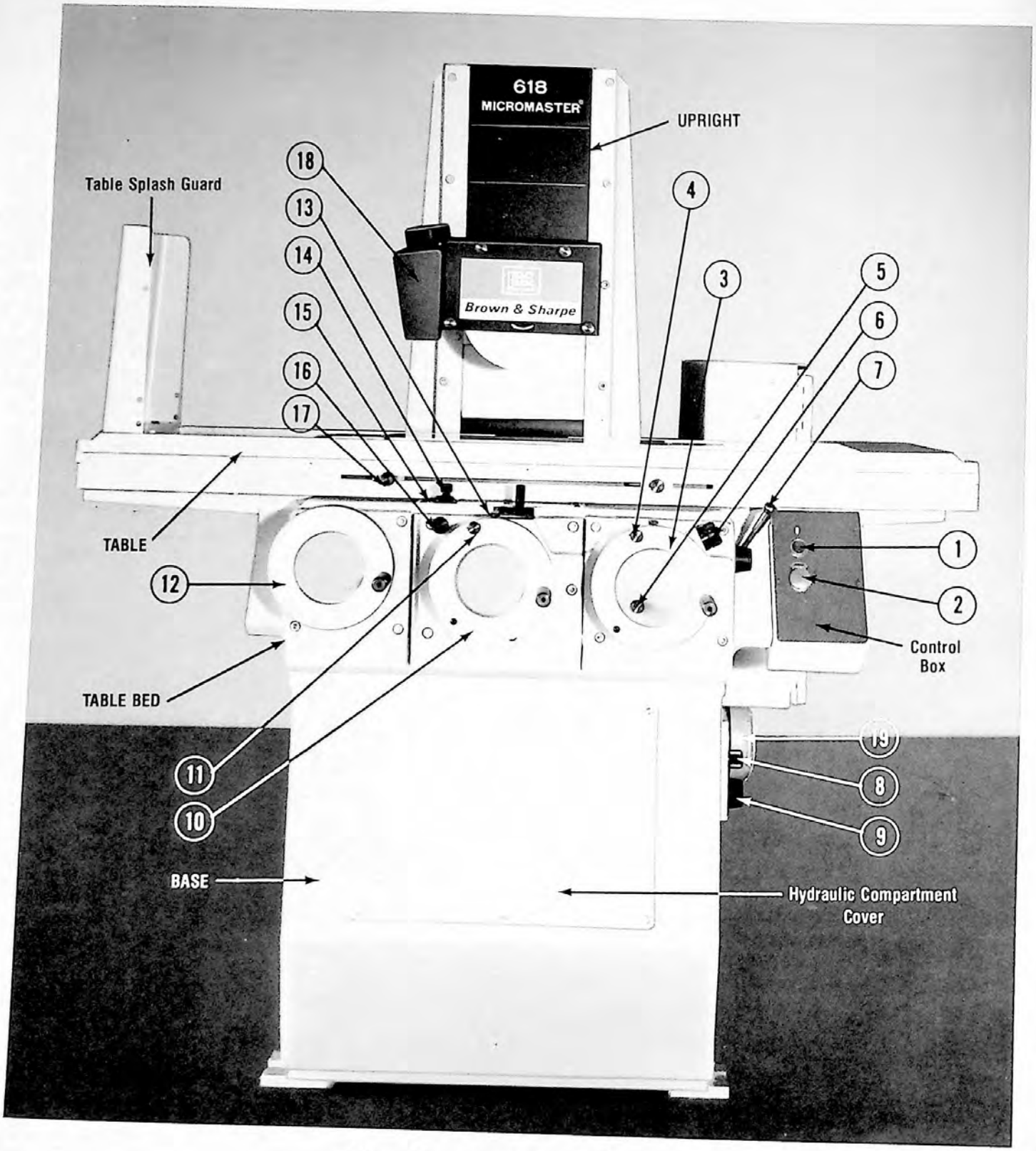

Fig. 1B. Front of machine.

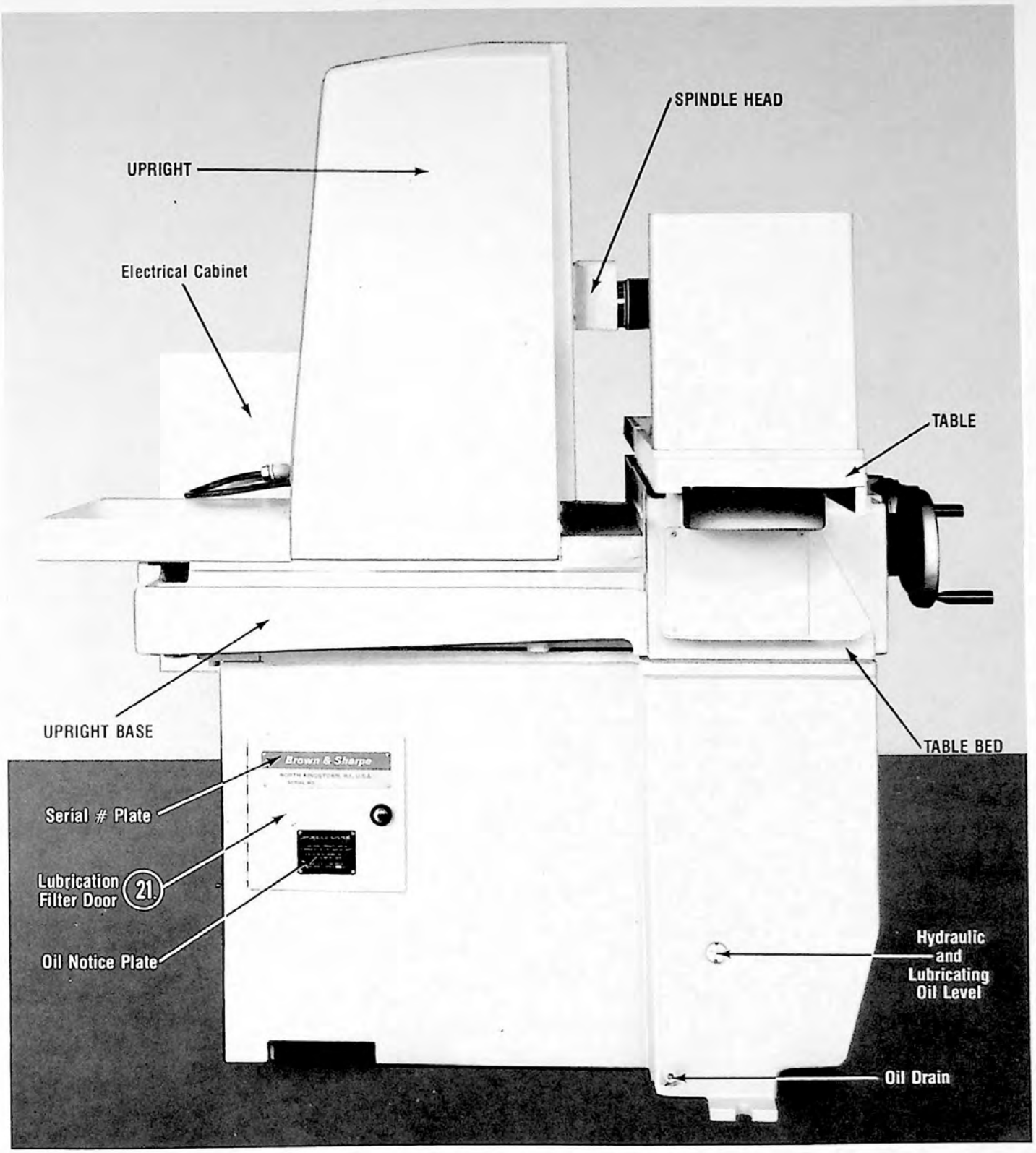

Fig. 2B. Left side of machine.

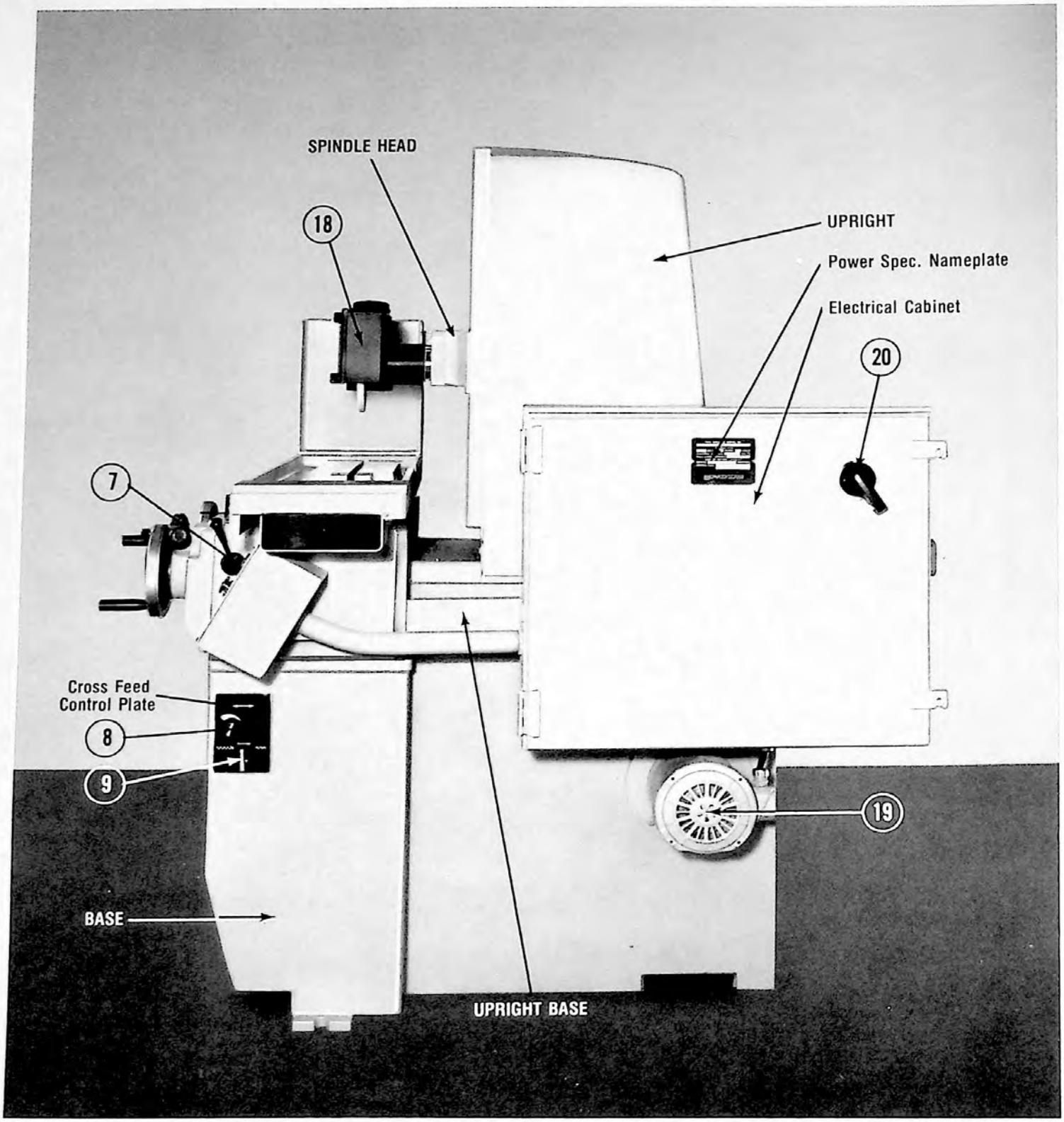

Fig. 3B. Right side of machine.

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SELECTION AND USE OF GRINDING WHEELS

The primary consideration in the selection of grinding wheels is the nature of the material to be ground. Other factors of importance are surface speed of wheel and work, amount of material to be removed, and accuracy and quality of finish desired.

The wheel regularly furnished with a MICROMASTER Surface Grinding Machine has characteristics which suit this wheel to general-purpose grinding. However, the material, volume of work, or finish requirements may make it advisable to use another selection more exactly suited to the job in process.

The various wheel manufacturers publish information which will be of help in selecting wheels of their own make. If desired, all details of the grinding operation may be submitted to the manufacturer for advice and recommendations.

Wheel Mounting, Balancing and Truing

Mounting Wheels:

One general purpose grinding wheel and one wheel sleeve are furnished with the machine. When additional wheels are used, extra wheel sleeves should be procured so that each wheel can be kept on its own sleeve. Then, in changing from one type of wheel to another, the wheel and sleeve can be changed as a unit and will remain concentric, requiring only a minimum amount of truing.

The wheel should fit easily on the wheel sleeve, yet not loosely. If it is loose, it can not be centered accurately and will consequently be out of balance. Do not wrap the sleeve with paper, etc., to make a wheel fit when the hole is too large. It is better from all standpoints either to discard such a wheel or recast the core.

A wheel that fits too tightly may crack if forced on the sleeve. If the hole is only a little under size, it can easily be scraped out to fit.

Before mounting a wheel, hang it in the air on one finger, then tap it lightly at the edge to see if it gives a clear ringing sound. A wheel that does not ring clear is probably cracked and should not be used.

The inner of the two flanges between which the wheel is mounted is part of the wheel sleeve (see Fig. 1C). The outer flange is keyed to the wheel sleeve to keep it from turning and loosening the clamping nut.

To equalize the clamping pressure, washers of cardboard or rubber should be placed between the wheel and the two flanges. Most wheels of the size used on this machine have a ring of heavy blotting paper on each side, which serves the purpose.

Using the pin wrench furnished, tighten the clamping nut only enough to hold the wheel firmly in place on the sleeve. Do not over-tighten. Excessive clamping pressure will crack the wheel

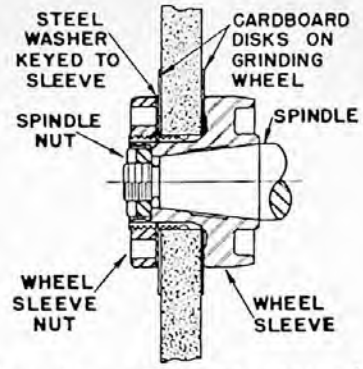

Fig. 1C. Proper mounting of grinding wheel.

Changing Wheels:

In removing a wheel sleeve from the spindle, always use the wheel sleeve puller (furnished with the machine) to avoid any risk of cracking the wheel or damaging the spindle bearings by pounding. Remove the spindle nut (this nut has a left-hand thread), then thread the outer member of the wheel sleeve puller into the wheel sleeve and tighten the inner screw against the spindle, thus loosening the wheel sleeve without harmful jarring.

In putting a wheel on the spindle, first see that both the wheel sleeve hole and the spindle end are perfectly clean. Then slip the sleeve onto the spindle, seat it by hand and tighten by means of the clamping nut and wrench.

Balance of Wheel:

It is essential that the wheel run perfectly true and without vibration. Grinding wheels are balanced by the manufacturer and, in the case of wheels of the size used on these machines, should not require attention in this respect other than truing. However, wheel sleeves with balancing segments are available as optional equipment.

A wheel that runs badly out of balance after truing should be discarded or returned to the manufacturer. When necessary, the condition may sometimes be corrected by digging out part of the wheel beneath the flange and filling with lead as indicated by a test for static balance.

Wheel Truing:

A wheel truing fixture is furnished with the machine. The truing diamond (not furnished) may be applied to the wheel along any line on the lower half of the wheel circumference, though preferably at the bottom of the wheel as shown in Fig. 2C. To prevent gouging, the center line of the diamond tool should point slightly beyond the center of the wheel in the direction of movement of the wheel surface.

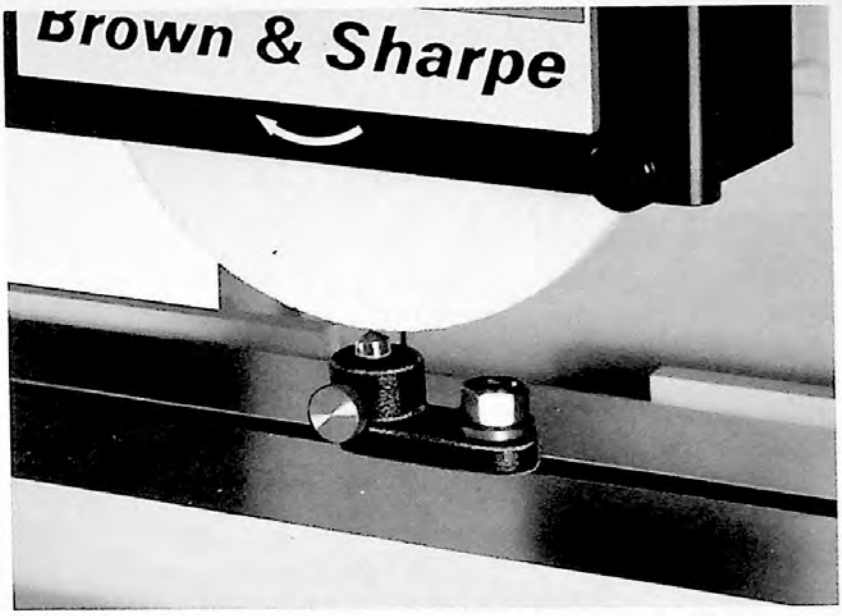

Fig. 2C. Table type wheel truing fixture.

The wheel should be trued each time it is put on the spindle and whenever it becomes loaded, dull or glazed. Pass the diamond across the wheel with a slow, steady cross feed, taking care to avoid any longitudinal movement of the table.

In truing a wheel for rough grinding, take a cut about .0005" (.01 mm) deep in one pass of the diamond across the wheel and finish with a similar cut .00025" (.006 mm) deep. If the wheel is to be used for finish grinding, take two .0005" (.01 mm) cuts, then take two or three additional cuts removing about .00025" (.006 mm) each time, and finally pass the diamond across the wheel once or twice without further advance of the wheel. The above amounts are approximate and may be varied somewhat as necessary to give desired results.

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SETUP AND OPERATION

The principal machine functions involved in machine operation are Start-up, Longitudinal Table Travel, Cross Feed Travel, Vertical Adjustment and Stop. The procedures for utilizing each of these functions are outlined below. (Refer to Section B, Figs. 1B, 2B, and 3B.)

1. Start-Up:
   a. Turn on Disconnect Switch (20).
   b. CAUTION: Check position of Table Throttle Lever (14) by rotating CCW to its Off position. Never start up the machine with the lever in any other position.
   c. Press Machine Start Pushbutton (1). This starts the spindle motor and the motor driving the pump for the hydraulic and lubricating systems.
2. Longitudinal Table Travel - Hand Feed Operation:

   a. Use the Table Handwheel. This is located on the left front of the machine. The Handwheel drives the table through a timing belt system under the table. One revolution of the handwheel moves the table 2 7/8" (73 mm). This is standard; 2" (50 mm) travel per revolution is optional. Clockwise rotation moves the table to the right.

3. Longitudinal Table Travel - Power Feed Operation :

   The table handwheel on Power Feed Machines moves the table 2" (50 mm) per revolution. Clockwise rotation moves the table to the right. For Power Feed travel:

   a. Turn Cross Feed Selector (9) to Grind position.
   b. Set table dogs (17). These dogs can be set to limit the table travel as required in either direction.
   Caution: Do not reciprocate the table until the dogs have been set. To set, loosen the table dog knobs to permit moving them along the front of the table. Using the Table Handwheel, move the table to the left and locate the desired point of reversal. Then move the right table dog until it contacts the reversing lever contact roller and set this dog by tightening the knob. Again with the Handwheel, move the table to the right until it reaches the opposite point of reversal. Then move the left table dog until it contacts the reversing lever roller, and set by tightening the knob.

In setting reversal limits for automatic power operation, be sure to allow sufficient over-travel. The work must travel far enough beyond the grinding wheel, in both directions, to allow time for the completion of cross feed before returning under the wheel.

c. To start Power Feed of Table, turn the Table Throttle Lever (14) clockwise. The Table Handwheel disengages and the table starts to move. Travel is progressively faster as the Throttle is opened. The table speed range is from 5 fpm (1.5 m per min.) to 100 fpm (30.5 m per min.).

d. Setting Table Speed. When the table is traveling at the desired speed, loosen the Bushing Lock Screw (16) and turn the Throttle Adjusting Bushing (15) counterclockwise until it stops against the Throttle Lever, then tighten the Lock Screw. The machine is now set at a table speed which will not require resetting if the machine is stopped and restarted.

e. To decrease Table Travel Speed. Turn the Table Throttle Lever in a counterclockwise direction to reduce table speed. Turn to Off position to stop table travel.

f. Flushing Table Cylinder. If the table travel is jumpy when first started, it is usually due to air in the Hydraulic cylinder. This can be corrected by reciprocating the table at high speed, under power feed, with the table dogs set far apart.

4. Cross Feed Travel:

a. Hand Feed - Handwheel Operation. The Cross Feed Handwheel is centrally located on the front of the machine. It controls forward and backward movement of the upright carrying the grinding wheel spindle. Clockwise rotation of the Handwheel feeds the wheel forward. .100" (2.54 mm) per revolution. It has an adjustable dial with a dual set of numerals on the graduations. The inner set of numerals read 0 to .100" (2.54 mm) in the clockwise direction. These numerals are used when grinding from front to back. The outer set of numerals read 0 to .100" (2.54 mm) in the counterclockwise direction. These numerals are used when grinding from back to front. Both sets of numerals are used when slot or side wheel grinding.

b. Hand Cross Feed with Fine Feed. A Fine Feed Dial graduated to .0001" (.002 mm) is available as optional equipment for these machines. This dial is engaged by rotating the fine feed lock clockwise. Clockwise rotation of the dial moves the wheel back.

c. Power Cross Feed Operation. Three modes of Power Cross Feed operation are provided - Truing, Grind and Rapid Position. These are established with the Selector Knob on the right side of the machine.

Grind - Turn the Cross Feed Selector Knob to Grind. This selects the intermittent cross feed. With the Cross Feed

Direction Lever (7) in the neutral position, start the table travel with the Table Throttle Lever. Next, position the Direction Lever for forward or reverse travel of the upright and adjust the amount of cross feed desired with the Cross Feed Amount Knob (8).

Truing - Turn the Cross Feed Selector Knob (9) to True. The direction of upright travel is selected with Cross Feed Direction Lever (7). With the Direction Lever set for forward or reverse travel, turn the Table Throttle Lever clockwise until it stops. This will start the cross feed. The truing rate is 10" (250 mm) per minute.

Rapid Position - Turn the Cross Feed Selector Knob to Rapid Position. Turn the Table Throttle Lever clockwise until it stops. Select the upright travel direction with the Cross Slide Direction Lever. The rapid positioning rate is 12 fpm (3.6 m per min.).

d. To stop the cross feed motion, turn the Cross Feed Direction Lever to Neutral. Also, both the cross feed and table can be stopped by turning the Table Throttle Lever to its Off position. The machine Stop pushbutton will stop all motions in an emergency.

5. Vertical Feed:

a. Handwheel Operation. The Elevating Handwheel, for vertical feed of the wheel to the work, is located on the right front of the machine. Counterclockwise rotation of the Handwheel feeds the spindle down .050" (1 mm) per revolution. An adjustable dial on the Handwheel is graduated to read to .0002" (.005 mm).

b. Vertical Fine Feed. A Fine Feed Dial (5), mounted adjacent to the Handwheel, is graduated to read to .0001" (.002 mm). This dial is engaged by rotating the Fine Feed Lock clockwise. Clockwise rotation of the dial feeds the spindle down.

(A Power Downfeed Arrangement, available at extra cost, is described in Section I - Optional Mechanisms and Equipment.)

6. Machine Stop:

a. Press Stop pushbutton. This stops all machine motions including spindle and pump motors.

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HYDRAULIC SYSTEM AND SPINDLE DRIVE

The principal components of the machine involved in its control and operation are the hydraulic system and the spindle drive. These are described in this Section, with instructions for maintenance procedures that will assure lasting efficiency and precision performance.

Hydraulic System

On Power Feed machines, the hydraulic system includes an oil reservoir, a motor-driven pump and the various valves necessary to transmit hydraulic power to the table drive and cross feed circuits. These elements are accessible through the opening in the front of the machine base by removing the face plate. The various units referred to in the following text are identified in the machine illustrations in Section B, and Figs. 1E, 2E, and 3E.

The machine Start pushbutton starts operation of the hydraulic pump, which continues until the Stop pushbutton is pressed.

Table Circuit:

The Table Throttle Valve (T) is actuated by the Table Throttle Lever (14) on the front shelf of the machine. This lever has three positions - Off, Middle and Open.

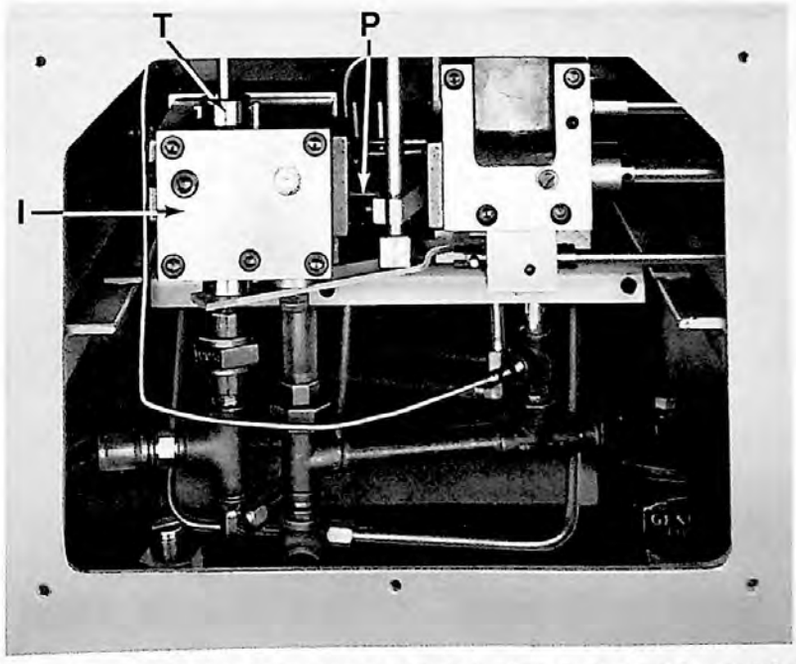


Fig. 1E. Hydraulic compartment in front of machine.

1. In the Off position, the two table cylinder lines are connected together, which allows oil from the pump to return to the reservoir at low pressure, with minimum increase in temperature. The Off position permits hand operation of the table only. The hydraulic system pressure should read 25 psi (1.76 kp/cm^2) or less.

2. In the Middle position, the oil from the pump is blocked, and the flow is diverted through the high pressure relief valve. The hydraulic pressure increases to 120 psi (8.44 kp/cm^2). This pressure in the handwheel piston serves to disconnect the table handwheel. It also permits rapid cross slide positioning and truing. On a machine with no hydraulic power cross feed, the Middle position is not used unless a hydraulically powered Over-the Wheel Truing Attachment (extra equipment) is used.

3. The Table Throttle Lever is Open when it is turned to any point beyond the Middle position. This permits the oil to flow to the table cylinder at increasing rates to provide table speeds from 5 to 100 fpm (1.5 to 30.5 m/min. - 60 cy. or 1.2 to 25.4 m/min. - 50 cy.).

The table can be operated under manual control only when the Table Throttle Lever is in the Off position.

Table reversing involves the operation of two valves in the hydraulic system - a pilot valve and a table reversing valve. The pilot valve (P) is connected mechanically to the Table Reverse Lever (13), which, when it contacts the table dog, switches the pilot spool. This permits oil flow to one or the other end of the reversing valve spool, shifting the spool to reverse the flow of oil to the table cylinder.

All table circuit valves - throttle, pilot and reversing are combined in one valve block (I). This block, mounted on its own subplate, is located at the left in the hydraulic system compartment.

Cross Feed Circuit:

Machines equipped with Power Cross Feed provide three different modes of operation under hydraulic power.

1. Rapid Positioning. The wheel can be moved rapidly to working position at the rate of 12 fpm (3.6 m/min.), permitting faster setups.

2. Wheel Truing. This mode permits dressing the wheel with a table-mounted diamond at the rate of 10 ipm (254 mm/min.), an optimum speed for wheel truing to assure fine finish.

3. Intermittent Cross Feed. This permits setup for cross feed travel, either in or out, in increments ranging from .01" (.254 mm) to .25" (6.35 mm) at each table reversal.

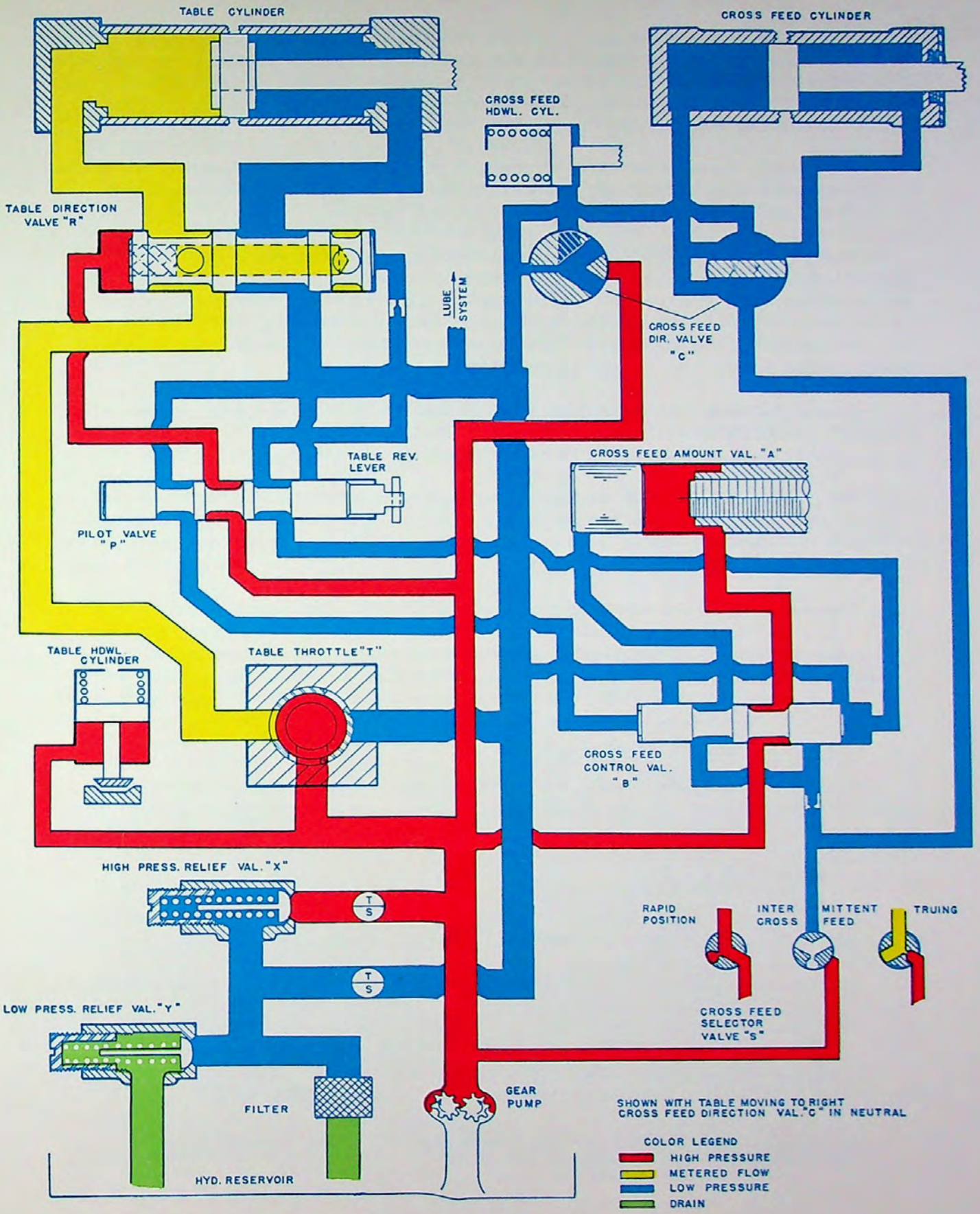


Fig. 2E. Schematic diagram of hydraulic circuits.

When the machine is operated in the Rapid Positioning or Wheel Truing modes, a mechanical interlock in the hydraulic system prevents movement of the table either manually or by power. Change from Rapid Positioning to Wheel Truing and vice versa can be made without first turning the table throttle to the OFF position.

Caution: Do not attempt to switch to either of these modes with the table moving. This may cause damage to the mechanical interlock which prevents table movement in these modes.

The cross feed circuit requires four control valves - a cross feed direction valve, a cross feed control valve, a cross feed amount valve, and a cross feed truing and rapid-positioning valve. These are combined in one valve block. This block, mounted on its own subplate, is located at the right in the hydraulic system compartment. In machines without power cross feed, the block is ommitted.

The direction valve is actuated manually by a lever (7) on the right side of the machine. This valve has three positions - Off, Forward and Back.

Off. When the lever is in this position, both the upright cylinder leads and the cross feed handwheel piston are connected to exhaust. This is the only lever position in which the upright can be moved manually.

Forward and Back. Moving the lever forward sets up a flow of oil to the cross feed cylinder, which causes the upright to move forward. Moving the lever back reverses the flow of oil and the motion of the upright. When the lever is in either forward or back position, the Cross Feed Handwheel and screw are disconnected by means of pressure flow which raises the cross feed screw nut.

After starting the table, cross feed movement at table reversal is obtained by setting the Cross Feed Direction Lever forward or back. When the Table Reverse Lever (13) contacts either table dog, it shifts the table Pilot Valve (P). This diverts pressure to one end of the cross feed control valve.

Interconnection permits transfer of pressure to the cross feed amount valve and results in a predetermined flow of oil to the upright clyinder.

The amount of upright movement at each table reversal is controlled by turning the Cross Feed Amount Knob (8) located on the right side of the machine. The Cross Feed Mode Knob (9) should be in the Grind position.

When the Cross Feed Mode Knob is set for Truing or Rapid Position, the table is mechanically interlocked to prevent movement.

Caution: Turn Table Throttle Lever to Off before calling for continuous upright movements.

Pressure Relief Valves: (Fig. 3E)

Pressure in the hydraulic system is controlled by two pressure relief valves which are adjusted and locked before the machine is shipped. The high pressure valve (A) is set for 120 psi (8.44 kp/cm^2) and the low pressure valve (B) for 5 psi (.35 kp/cm^2).

If, for any reason, these settings are disturbed, the valves can be easily reset. Check the high pressure valve by removing the 1/4 inch pipe plug (C) and attaching a pressure gage. The pressure should read 120 psi (8.44 kp/cm^2) when the table throttle is opened to the point where the table is just about to start to creep.

The low pressure relief valve is similarly tested. The gage is attached at (D). It should read between 5 and 6 psi (.35 kp/cm^2 and .42 kp/cm^2).

Caution: High pressure exceeding 120 psi (8.44 kp/cm^2) can overload the 1 hp pump motor. Low pressure readings below 5 psi (.35 kp/cm^2) indicate pressures too low for proper lubrication.

To change the pressure setting on either relief valve, loosen the check nut. Next, turn the adjusting screw (E) clockwise to increase pressure and counterclockwise to decrease it. Then tighten the check nut, making sure the adjusting screw doesn't turn with it.

After a low pressure adjustment is made, be sure to check the high pressure again, since this may have been affected. For this reason, it is suggested that two pressure gages be used. It is also recommended that the gages used do not out-range the above pressures by very much as this could result in inaccurate readings.

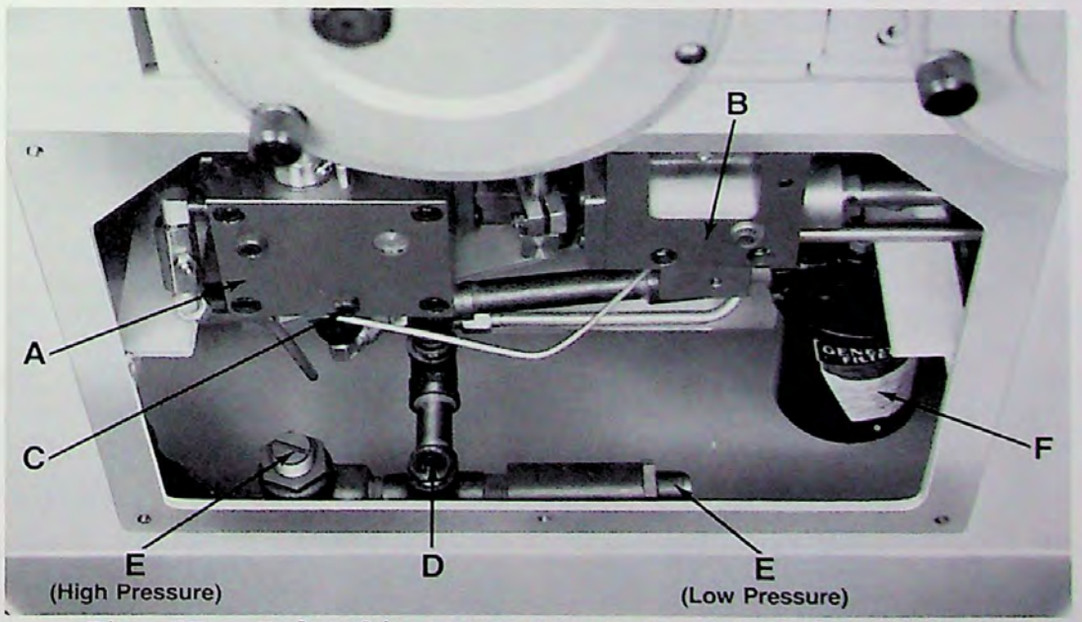


Fig. 3E. Hydraulic compartment as viewed from above.

GENERAL FILTER ELEMENT NO. 2A710

Hydraulic System Maintenance:

The reservoir for the hydraulic system should be filled with approximately 22 gallons (83.3 liters) of "combination hydraulic fluid and slide way lubricant" with a viscosity of 150 SUS (32 CST) at 100° F (38° C), which complies with ASLE W-150 standards (recommended, Socony-Mobile Vacuoline #1405).

The oil, and the by-pass filter (F), Fig. 3E, should be changed annually (or even more frequently on machines in constant use). The oil can be removed from the reservoir through a flexible tube connected to the pump discharge and emptying into a suitable container outside the machine. Remove the drain plug to get out all the oil at the bottom of the reservoir, and when it is empty, wipe it out with a lint-free rag saturated with solvent.

Oil that has been removed from the reservoir should not be reused unless it has been passed through a 25 micron filter.

After the oil change, run the pump for about an hour with the Table Throttle Lever in the Off position. This will distribute oil throughout the system and remove air from the hydraulic cylinders. When this run is completed, check the sight gage, and add more oil as necessary to bring it to Full level.

Valves sometimes become sticky due to gum deposits when a machine has been idle for a long time. If this happens, use one of the suitable solvents (available from several oil companies) and run it through the system for about four hours. Flush it out, and refill the system with fresh oil.

Lubrication System

In machines having power table feed, or both power table and cross feeds, the lubrication is supplied by tapping off the hydraulic system. This provides a pressure of 5 to 6 psi (.35 kp/cm^2 to .42 kp/cm^2), which will force the oil through the meter unit for lubrication as called for.

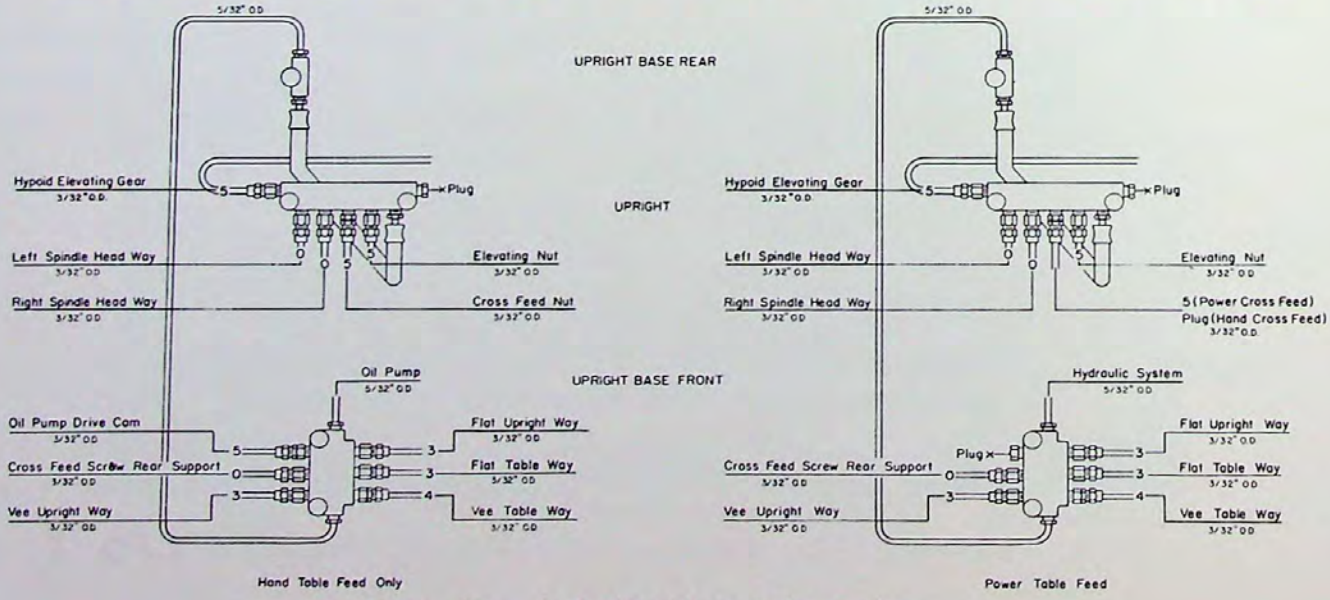


Fig. 4E. Lubrication Schematic

The oil drains back to the reservoir through a filter which is located inside a door on the left side of the machine. The filter has a 200 mesh stainless steel cartridge. This should be cleaned at least once a year and, if damaged, should be replaced. To remove the filter, loosen the large bolt at the top of the filter container and the container will drop down, exposing the filter cartridge.

In machines which have hand feed only, a lubrication pump is operated by the movement of the table handwheel. The filter at the intake of this pump should be cleaned annually (see Fig. 5E for instructions). The oil reservoir on these machines holds 6 gallons (22.7 liters) and should be filled with a high lubricity way oil which has a viscosity of 150 SUS (32 CST) at 100° F (38° C) and which complies with ASLE W-315 standards (recommended, Socony-Mobile Vacuoline #1405).

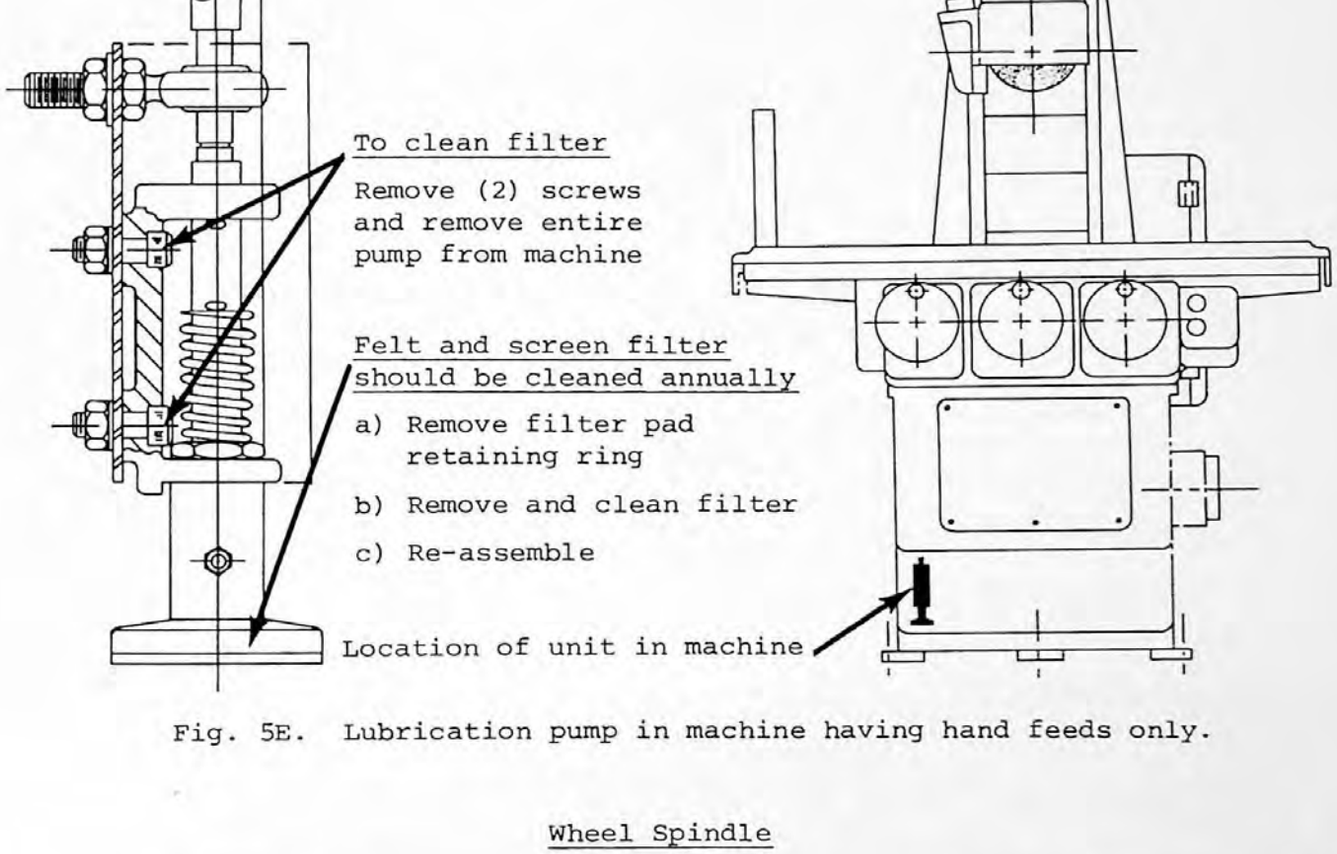


Fig. 5E. Lubrication pump in machine having hand feeds only.

Wheel Spindle

These machines are equipped with a super-precision antifriction bearing wheel spindle with either Oriflex or direct motor drive.

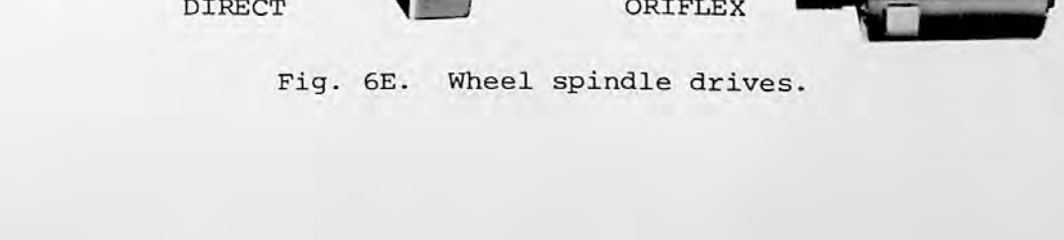


Fig. 6E. Wheel spindle drives.

Oriflex Drive:

This spindle is powered through six "O" rings from a 1 hp (.75 kw) motor. The wheel sleeve furnished takes wheels up to 8" (203 mm) diameter and 1/2" (12.7 mm) wide. A larger wheel sleeve available at extra cost, takes wheels up to 1" (25.4 mm) wide.

Direct Motor Drive:

Three different spindles of this type are available.

1. 1 1/2 hp (1.12 kw) - 3600 rpm 60 cy - 3000 rpm 50 cy
2. 2 hp (1.49 kw) - 3600 rpm 60 cy - 3000 rpm 50 cy
   These spindles will accomodate 7" (177.8 mm) dia. wheels.
3. 2 hp (1.49 kw) - 1800 rpm 60 cy - 1500 rpm 50 cy
   This spindle accomodates 12" (304.8 mm) wheels.

Spindle is High Precision Mechanism:

A grinding machine spindle has the same characteristics as a high precision instrument, and should be treated at all times with corresponding care. As an example of its accuracy, note that a variation of one hundred thousandth of an inch - .00001" (.000254 mm) - in a ground flat surface will be visible to the naked eye as a wheel mark.

Therefore, never hammer on the ends of the spindle, drop it on the floor or workbench, or otherwise subject it to force or impact.

If eventually a spindle should need repair or adjustment, we recommend that it be returned to Brown & Sharpe for reconditioning. Where machines are in continuous operation, it is advisable to keep a spare spindle on hand. It can be installed to keep the machine affected in production while the original spindle is being repaired.

See Section G - Maintenance - for instructions for removing and replacing a spindle.

Brown & Sharpe 618 and 818 MICROMASTER
Series II
Surface Grinding Machines

TYPICAL OPERATIONS

The operations shown in this Section are representative of the various types of work which can be performed on the 618 and 818 MICROMASTER Surface Grinding Machines.

Some of the operations shown utilize various types of optional equipment which is listed and described in Section I.

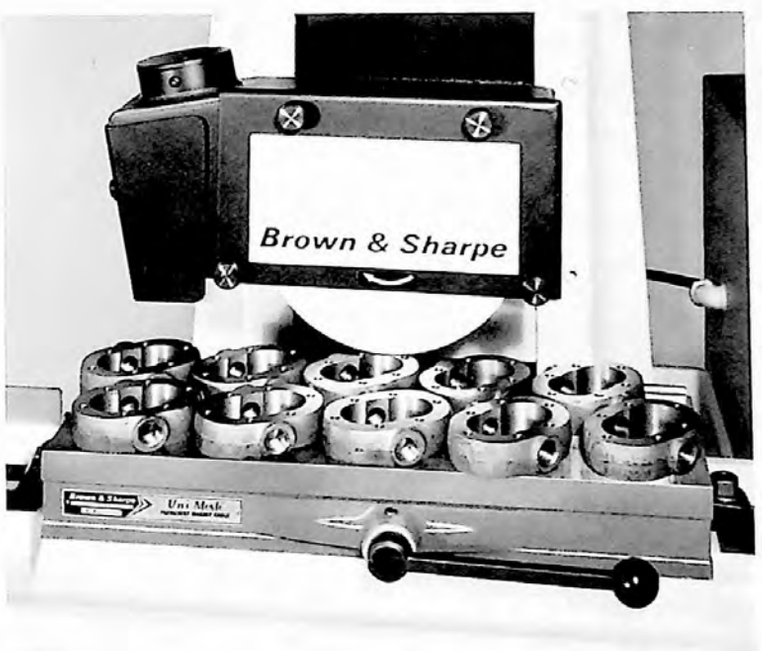


Fig. 1F. A representative production job, grinding the surfaces of ten pieces with one loading of the chuck.

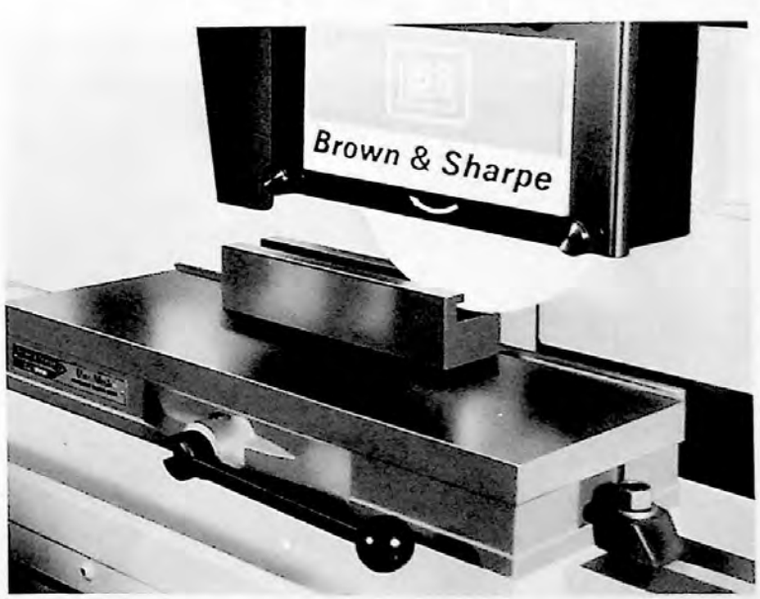


Fig. 2F. The table setting in fixed ways contributes immeasurably to slot and other forms of side wheel grinding.

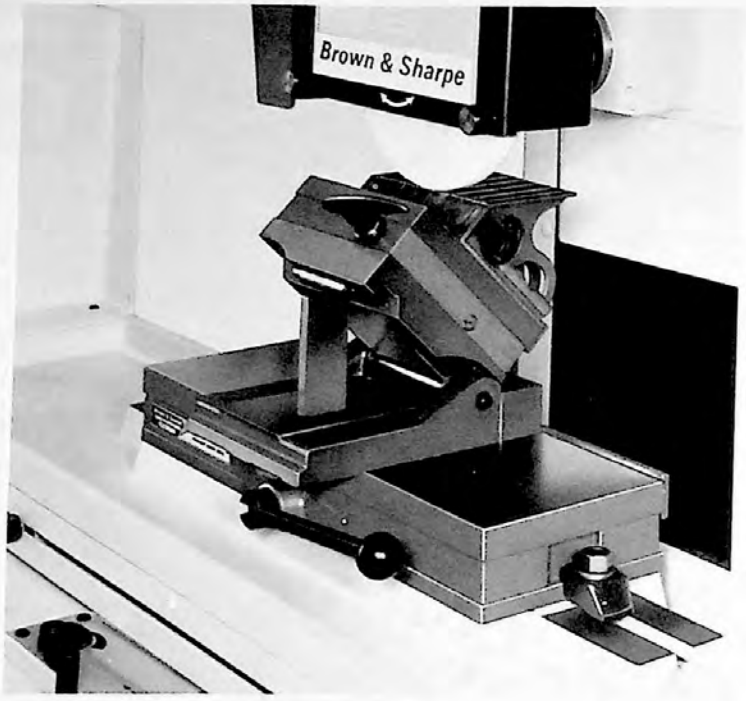


Fig. 3F. Machine has ample vertical capacity for tall jobs.

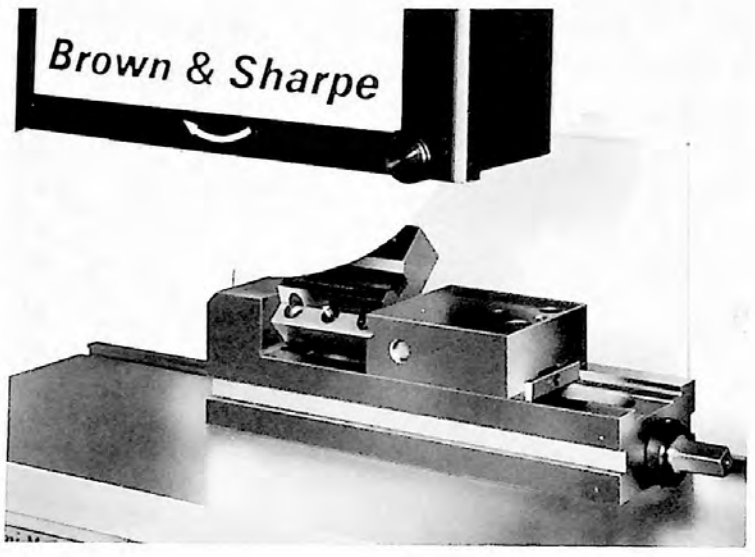


Fig. 4F. Grinding one side of a "V".

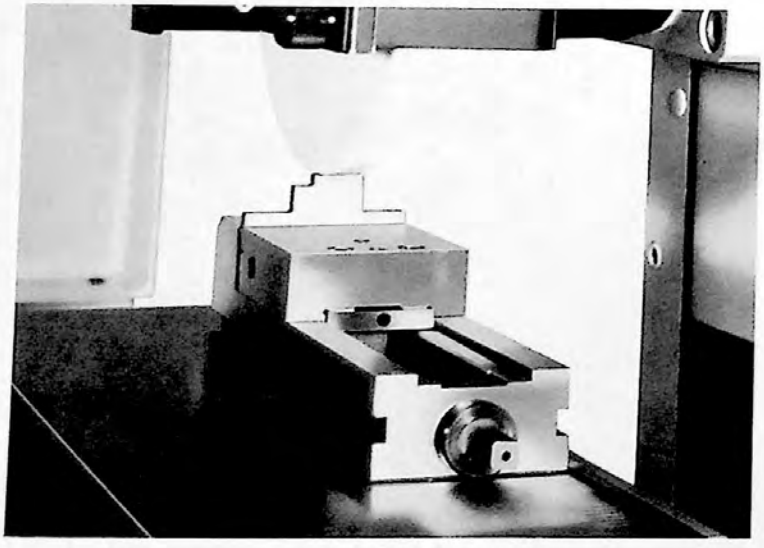


Fig. 5F. Grinding a series of steps.

Brown & Sharpe 618 and 818 MICROMASTER
Series II
Surface Grinding Machines

MAINTENANCE

Direct Drive Spindle Unit

Removal from machine:

1. Remove wheel guard cover.
2. Remove wheel and wheel sleeve.
3. Remove wheel guard by loosening the two clamp screws on the rear extension of the guard and pulling forward.
4. Remove the rear upright cover.
5. Remove screw (A) at the lower right of the spindle front support (see Fig. 1G).
6. Remove the top set screws (B) in the front support.
7. Loosen spindle clamping screw (C).
8. Disconnect the motor cable.
9. Wrap the threads and taper, on the spindle, with several layers of tape to prevent damage during removal.
10. Draw the spindle unit out from the rear of the machine.

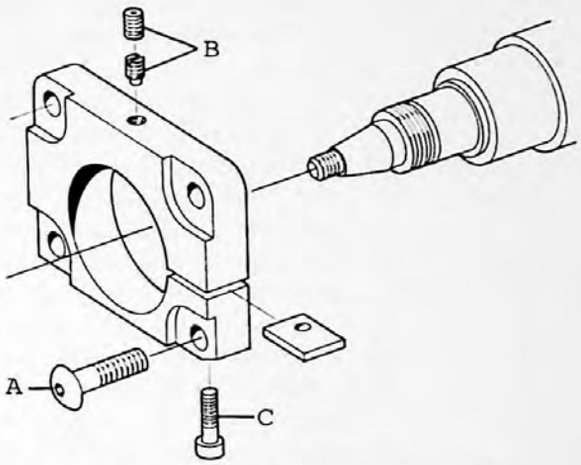


Fig. 1G. Direct drive spindle front support.

Replacement in machine:

1. Replace the spindle unit, inserting from rear of machine.
2. Connect motor cable.
3. Replace the top set screws (B) in the front support.
4. Tighten the spindle clamping screw (C) just enough to eliminate any looseness. Do not over-tighten.

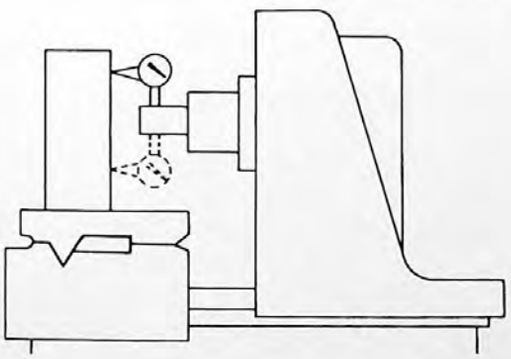


Fig. 2G. Top of table is square crosswise with sweep of spindle.

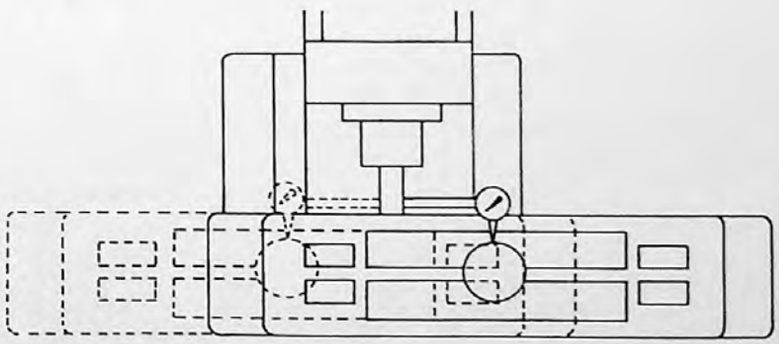


Fig. 3G. Wheel spindle is square with table ways.

5. Replace the lower right screw (A) in the spindle front support.
6. Check the spindle alignment (Figs. 2G and 3G):
   Align the spindle to the machine, if necessary, by shifting the front support. Using a Precision Square or Toolmaker's Cylindrical Square, indicate from the spindle nose and align the spindle vertically and horizontally within .001" (.025 mm) in a 5" (127 mm) radius.
   For cross hatch slot grinding, the spindle may need closer alignment. This can be obtained by making test grinds and adjusting as necessary.
7. Tighten the four screws on the face of the front support.
8. Replace the wheel guard and clamp.
9. Replace the wheel and wheel sleeve.
10. Replace the wheel guard front cover.
11. Jog spindle to be sure the wheel is rotating clockwise.
12. Replace the rear upright cover.

Oriflex Drive Spindle Unit

Removal from machine:

1. Remove wheel guard cover.
2. Remove wheel and wheel sleeve.
3. Remove wheel guard by loosening the two clamp screws on the rear extension of the guard and pulling forward.
4. Remove the upright rear cover.
5. Remove the screw that supports the lower sliding guards under the spindle head and lower the guards.
6. Remove the six "O" rings by rotating the spindle pulley and working the rings off. Do not loosen the motor, which has been aligned at the factory.
7. Remove the spindle pulley set screw locking screw and back off set screw (located in one of the grooves). Be careful not to lose the locking screw as it is essential to the balance of the pulley.
8. Remove the four spindle unit flange clamping screws.
9. Draw the spindle unit slowly out toward the front of the machine while holding the spindle pulley.
10. When the pulley slips off the spindle, remove it and withdraw the spindle completely from the machine.

Replacement in machine:

1. Clean the mating surfaces of the wheel head and the back of the spindle flange.
2. Insert the spindle into the wheel head enough to start the pulley onto it.
3. When the pulley is started, slide the spindle into the wheel head while guiding the pulley.
4. Replace the four screws in the spindle flange, finger tight.
5. Line up the face of the spindle pulley with the face of the motor pulley. A steel scale can be used for this purpose. Work through the opening exposed under the lower vertical guards. Correct alignment of the pulleys is essential to insure "O" ring service life.
6. With the pulley faces lined up, tighten the set screw in the spindle pulley. Replace the set screw lock screw.

7. Hang the six "O" rings over the motor pulley. Work the front ring over the pulleys until it is all the way forward. In like manner, work each remaining ring over the pulleys until it is in its proper groove in each pulley.
8. Replace the upright rear cover.
9. Align the spindle as described in step #6 (on page G2) under instructions for replacement of Direct Drive Spindle Unit in machine.

Spindle Head Gib Adjustment (see Fig. 4G)

Using the special gib adjustment wrench and T-handle Allen locking wrench furnished with the machine proceed as follows -

1. Remove the four plug buttons from the front of the upright straps.
2. Position the spindle head so that the adjusting screws are aligned with the holes in the upright straps.
3. Insert the adjusting wrench into the slot in the gib adjusting screw.
4. Insert the Allen locking wrench through the hole in the adjusting wrench and into the locking screw.
5. Rotate the locking screw counterclockwise while preventing the adjusting screw from turning with the adjusting wrench. Loosen all four adjusting screws in this manner.
6. Adjust the gibs by turning the adjusting screws counterclockwise until they are snug, then turn them back slightly (less than 1/8 of a turn). While preventing the adjusting screws from turning with the adjusting wrench, lock them in position by turning the locking screws clockwise.
7. Check adjustment by raising and lowering the spindle head with the elevating handwheel. The head should move freely with no bind and no "hang-up".
8. Check for spindle "hang-up" by placing an indicator base on the upright base and indicating the spindle head. With the table running, feed the head down and check the response.
9. Replace the plug buttons in the upright straps.

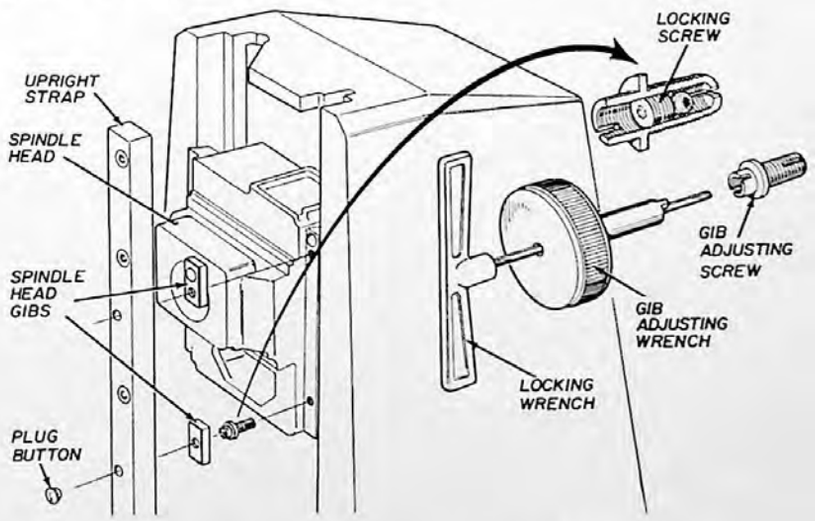


Fig. 4G. Spindle Head Gib Adjustment.

changing the Table Drive Belt

1. Centralize the table.
2. Back off the belt tension locknut (A, Fig. 5G) at the right end of the table.
3. Loosen the belt tension screw (B).
4. Loosen the belt plate clamp screws (C) and release the belt.
5. Unclamp the belt at the left end of the table.
6. Tape the new belt to the old belt with the teeth facing in the same direction. Tape with approximately a 1 1/2" overlap.
7. Pull the opposite end of the old belt slowly so that the new belt will engage the belt sprocket and feed through properly.

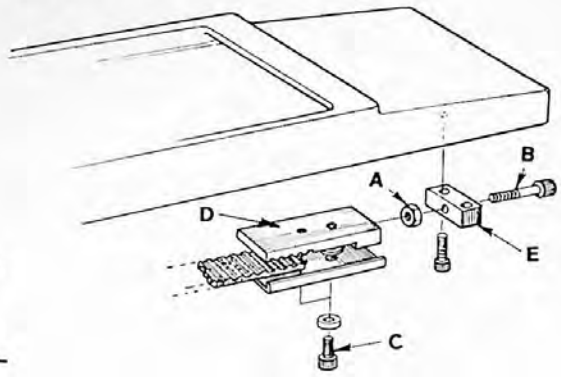


Fig. 5G. Construction at right end of table drive belt.

8. Untape the old belt.
9. Clamp the new belt at the left end of the table.
10. Clamp the belt to the belt tension block (D).
11. Adjust the belt tension to allow the screw (B) to move sideways in its support (E). Do not overtighten.
12. Rotate the handwheel to check sprocket engagement and proper table movement.
13. Lock belt tension adjusting screw (B) with locknut (A).

Adjustment of Bearings at Back End of Cross Feed Screw

1. Move upright to rear position and remove base ways guard at its lower rear.
2. Move upright to forward position.
3. Loosen socket head clamp screw in adjusting nut (see Fig. 6G).
4. Have cross feed handwheel held to prevent cross feed screw from turning. Grasp adjusting nut with thumb and forefinger and turn it clockwise until "metal to metal" contact is obtained. Then, using pin wrench in hole in adjusting nut, preload the bearings by tightening adjusting nut approximately 1/16" more as measured on the periphery of the nut.
5. Tighten socket head clamp screw in adjusting nut.
6. Replace base ways guard at rear of upright.

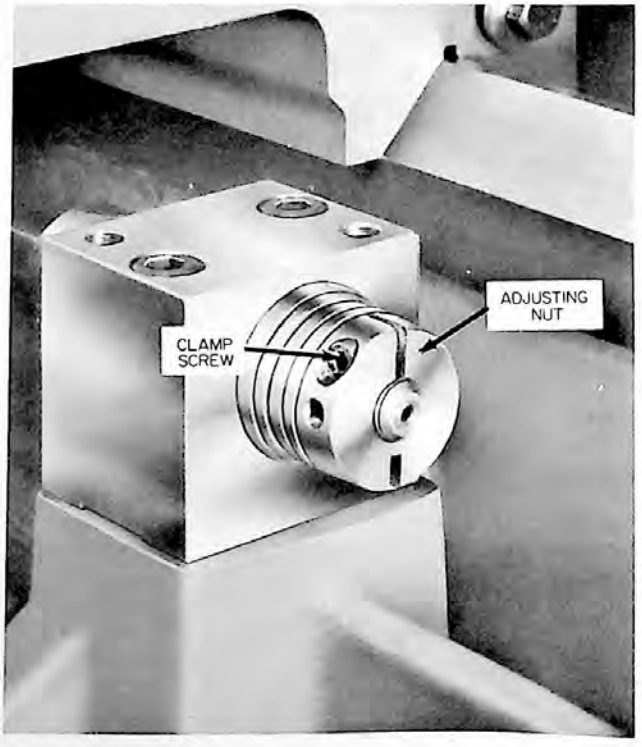
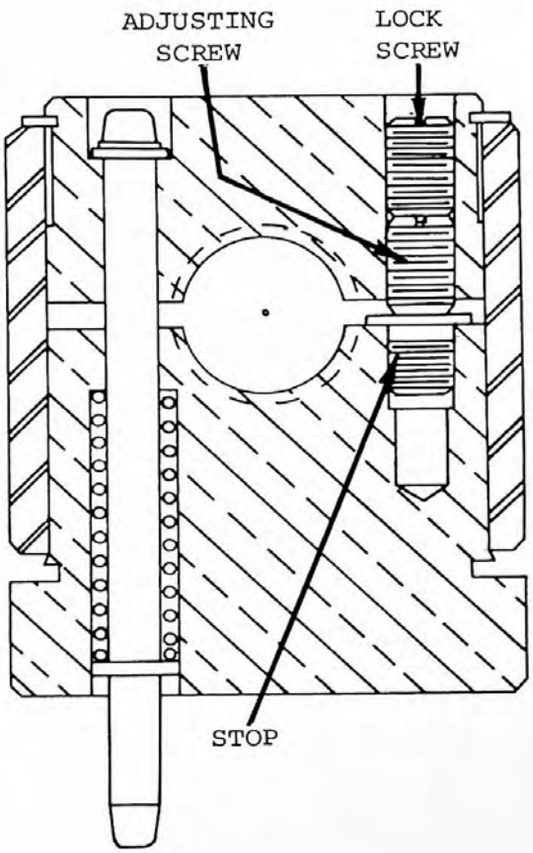


Fig. 6G. Adjustment of Bearings at Back End of Cross Feed Screw.

Adjusting the Power Cross Feed Nut

1. Remove upright rear cover.
2. Remove lock screw (see Fig. 7G).
3. Back off adjusting screw and then turn clockwise until the screw contacts the stop.
4. Check backlash.
5. Replace lock screw.
6. Replace upright rear cover.



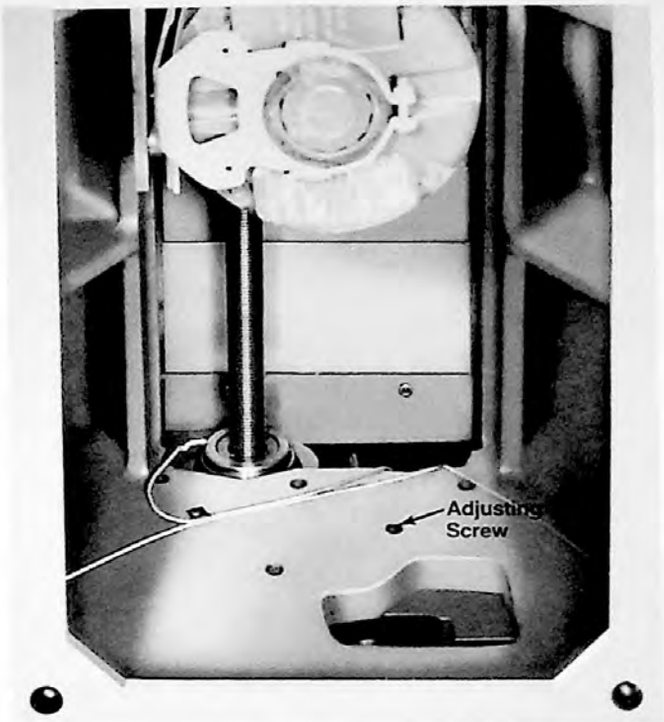


Fig. 7G. Location, and sectional drawing of power cross feed nut.

Elevating Screw and Nut

Every two years of normal usage, the elevating nut and screw should be checked for wear. If noticable wear is detected, both nut and screw should be replaced.

Brown & Sharpe 618 and 818 MICROMASTER
Series II
Surface Grinding Machines

TROUBLE SHOOTING GUIDE

Hydraulic pump motor heaters dropping out:

Check 1. Voltage
2. Motor connections
3. High pressure
4. Pump for damage
5. Electric motor for damage

Low oil pressure:

Check 1. Oil level
2. Oil lines for leaks
3. Relief valve malfunction
4. Pump for damage
5. Electric motor speed

Excessive lubrication:

Check 1. Low pressure

No top table speed:

Check 1. Throttle throw
2. For oil leaks
3. Relief valve malfunction (80# Min. PSI at Maximum Table Speed)
4. Alignment of table throw-out piston shaft
5. Lubrication on ways
6. Is proper oil being used?

Table bounces:

Purge cylinder of air (Page E6)
Check 1. Lubrication of ways
2. Piston rod for damage

Table slow on reversals:

Check 1. Orifice plug under right hand cover of table valve
2. Is spool of reversing valve free moving?
3. Reaction of pilot valve spool to table reverse lever

Table does not move:

Check 1. Piston rod nut
2. Position of cross feed mode lever
3. Machine pressures
4. For sticky table ways - move table by hand
5. Lubrication to table ways

Table handwheel spinning:

Check 1. Line to piston for leak
2. Alignment of piston and clutch
3. High pressure relief valve for malfunction
(High Pressure does not drop below 85-90 PSI at 100 RPM)

No cross feed movement:

Check 1. Table throttle - is it in pressure or table speed position?
2. Cross feed mode lever
3. Cross feed direction lever
4. Cross feed amount valve - is it shut off?
5. Cross feed nut - is it disengaged?
6. All pistons in cross feed valve block for free movement

Cross feed bounce:

Purge cylinder to clear air.
Check 1. Lubrication of ways
2. Piston rod for damage

Large variation of pick - forward and back:

Check 1. Positioning of cross feed direction valve
2. Seal on piston rod
3. Piping for leak

Slow truing speed:

Check 1. Orifice in cross feed mode selector valve

Excess backlash in cross feed handwheel:

Check 1. Rear thrust bearings
2. Cross feed nut - adjust as necessary

Cross feed handwheel rumble:

Check 1. Cross feed screw - if not aligned, readjust at cross feed thrust bearings

Noisy spindle (with Oriflex drive):

Check 1. Pulley adjustment
2. Condition of the "O" rings
3. Motor alignment

Causes and Corrections of Common Grinding Errors

CHATTER

Indication	Cause	Correction
Chatter marks may take any of several forms and may be the result of any of causes listed.	Wheel out of balance.	Rebalance carefully on own mounting. Rebalance after truing operation. Run wheel without coolant to throw off excess water. When wheel is removed from machine, store on side to prevent water from settling at lower edge of wheel.
	Wheel out of round.	True before and after balancing. True sides to face.
	Wheel grading too hard.	Select softer grade, more open bond, or coarser grit.
	Dressing.	Use sharp diamond - rigidly held close to wheel.

SCRATCHING OF WORK

Indication	Cause	Correction
Narrow and deep regular marks.	Wheel too coarse.	Use finer grain size.
Wide, irregular marks of varying depth.	Wheel too soft.	Use harder grading.
Widely spaced spots on work.	Oil spots or glazed areas on wheel face.	Balance and true wheel. Avoid getting oil on wheel face.
Isolated deep marks.	Improper wheel dressing.	Use sharper dressing tools. Brush wheel after dressing, preferably with stiff bristle brush.
	Coarse grains or foreign matter in wheel face.	Dress out.
Irregular marks.	Bond disintegrates, grain pulls out. Loose dirt.	Coolant too strong for some organic bonds; decrease soda content. Keep machine clean

SCRATCHING OF WORK - continued

Indication	Cause	Correction
Irregular marks of various lengths and widths: scratches usually "fishtail".	Dirty coolant.	Clean tank more frequently. Flush guard after dressing and when changing to finer wheels.
Deep, irregular marks.	Loose wheel flanges.	Tighten flanges, using blotters.
	Wheel too coarse or too soft.	Select finer grain size or harder grade wheel.
	Too much difference in grain size between roughing and finishing wheels.	Use finer roughing wheel or finish out better with roughing wheel.
	Dressing too coarse.	Less dresser penetration and slower dresser traverse.
	Improper cut from finishing wheel.	Start with high work and traverse speeds, to cut away previous wheel marks. Finish out with high work and slow traverse speeds, allowing wheel to spark out entirely.

WHEEL GRADING EFFECT

Indication	Cause	Correction
Lack of cut: glazing: some loading: burning of work: chatter.	Wheel too hard in effect.	Increase work and traverse speeds and wheel pressure (downfeeds). Decrease wheel diameter and width of wheel face. Open up wheel by sharper dressing. Use thinner coolant. Avoid gummy coolants. Use coarser grain size and softer grade.
Wheel marks: short wheel life: not holding cut.	Wheel too soft in effect.	Decrease work and traverse speeds and wheel pressure (downfeed). Increase wheel diameter and width of wheel face. Dress with slow traverse and slight penetration. Use heavier coolants.

WHEEL LOADING

Indication	Cause	Correction
Metal lodged on grains or in wheel pores.	Incorrect wheel.	Use coarser grain size, or more open bond, to provide chip clearance. Use more coolant.
	Faulty dressing.	Use sharper dresser. Dress faster. Clean wheel after dressing.
	Faulty coolant.	Use more, thinner and cleaner coolant.
	Faulty operation.	Manipulate operation to soften effect of wheel. Use less down-feed.

WHEEL GLAZING

Indication	Cause	Correction
Shiny appearance: slick feel.	Improper wheel.	Use coarser grain size, softer grade. Manipulate operation to soften effect.
	Improper dressing.	Keep wheel sharp with sharp dresser. Use faster dressing tool traverse. Use more dressing tool penetration.
	Faulty coolant.	Use less oily coolant. Use more coolant.
	Gummy coolant.	Increase soda content if water is hard. Do not use soluble oils in hard water.
	Faulty operation.	Use greater infeed.

INACCURACIES IN WORK

Indication	Cause	Correction
Work is not flat.	Improper dressing.	Make sure machine conditions are the same when dressing as when grinding.
	Expansion of work.	Reduce temperature of work by using more coolant and lighter cuts.

CHECKING OF WORK

Indication	Cause	Correction
Work shows check marks.	Improper wheel manipulation.	Prevent wheel from acting too hard. Do not force wheel into work. Use larger and more even flow of coolant.
BURNING OF WORK		
Indication	Cause	Correction
Work shows discoloration.	Improper wheel.	Use softer wheel or manipulate to get softer effect. Prevent glazing and loading. Use more coolant.
	Faulty operation.	Bring wheel to work more gradually. use less downfeed. Prevent stoppage of work while in contact with wheel.

WHEEL BREAKAGE

Indication	Correction
Radial break, three or more pieces.	Reduce wheel speed to rated speed. Correct improper mounting such as lack of blotters, tight arbors, uneven flange pressure or dirt between flanges and wheel. Prevent overheating due to lack of coolant. Prevent excessive wheel pressure on work. Do not allow wheel to become jammed on work.
Radial break, two pieces.	Prevent excessive side strain.
Irregular break.	Do not allow wheel to become jammed on work. Prevent blows on wheel. Do not use wheels that have been damaged in handling. Examine wheel before using. Sound wheel by tapping.
General.	Do not attempt to grind with a wheel that is too tight on the arbor, as wheel will break when started. Prevent excessive hammering action of wheel. Familiarize yourself with the provisions of the Safety Code governing use of grinding wheels, and observe the rules.

Brown & Sharpe 618 and 818 MICROMASTER
Series II
Surface Grinding Machines

OPTIONAL MECHANISMS AND EQUIPMENT

The wide selection of optional equipment for 618 and 818 MICROMASTERS, available at extra cost, is described in the following pages. It includes supplementary mechanisms, attachments and accessories which extend MICROMASTER capabilities and permit their adaptation to an unlimited variety of specialized requirements.

Dial-A-Size
(covered in separate booklet)

Power Down Feed Arrangement

This arrangement provides for fully adjustable Automatic control of the down feed when grinding slots and surfaces within the wheel width. Down feed occurs at each table reversal. The amount of this feed is in increments of approximately .0002" (.005 mm). A positive stop permits termination of the feed at any depth to approximately .04" (1 mm). This stop may be retracted to permit automatic down feeding over the entire range of the wheel slide.

The mechanism is designed so that the pawl is completely withdrawn from the tooth spaces of the ratchet wheel during each recovery stroke to avoid scraping the top of the teeth during recovery.

Index dial - This dial is used for fine adjustments. The handwheel can be set at zero at the positive stop position and readings made directly from the index dial. To get accurate readings, the wheel stop should bear against the right side of the positive stop. With the handwheel set at the positive stop, the index dial is turned back the desired amount. The mechanism will then feed down the amount selected.

If positioning will require many turns of the handwheel, pull out the downfeed adjustment pinion in the center of the index dial to disengage the handwheel. Turn the handwheel

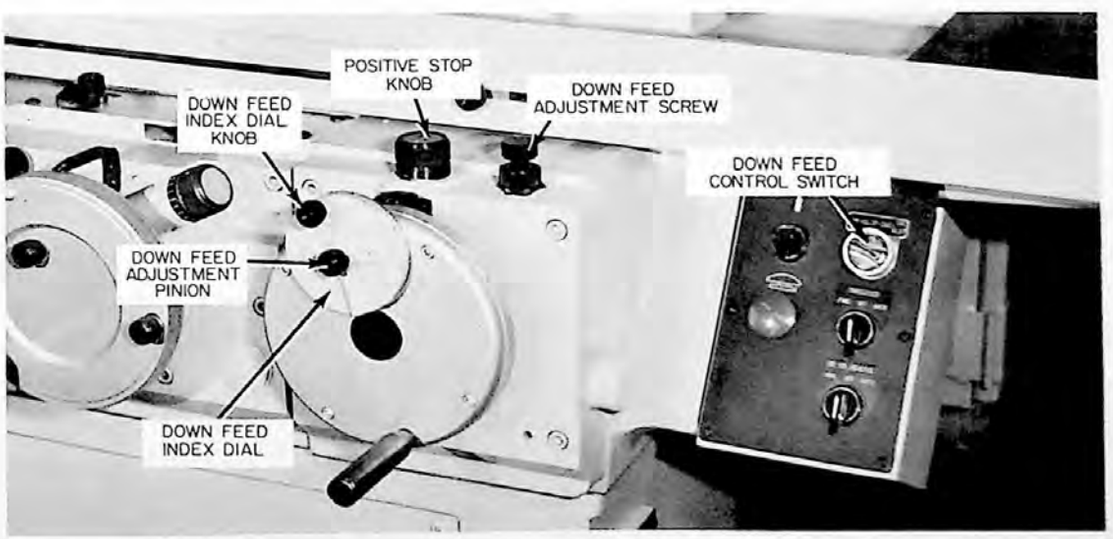


Fig. 1I. Power down feed arrangement.

the required amount and push in the pinion. Then make any necessary fine adjustments by turning the index dial.

Setting the positive stop A pin in the back of the elevating handwheel, located behind the index dial, comes in contact with the right hand side of the positive stop for the downfeed movement. The handwheel reading is then zero. To set the stopping point for the desired finished size of the work, proceed as follows:

1. With the other setup adjustments completed and the workpiece in place, use the handwheel for vertical adjustment until the grinding wheel just touches the work.

2. Pull out the downfeed adjustment pinion, freeing the handwheel. Turn the handwheel until the pin comes against the right hand side of the positive stop.

3. Re-engage the downfeed adjustment pinion. Check the size of the work, and make necessary adjustments with the downfeed index dial, always working to the positive stop. The repeat accuracy will then be assured, under normal operating conditions.

Included in this arrangement is a friction device which keeps a drag on the handwheel. This device can be adjusted for individual preference when the handwheel is used manually. The adjustment is located below the handwheel. The device also prevents backlash of the handwheel when the ratchet is engaged.

The Power Downfeed Arrangement provides the advantages of automatic downfeed, and also permits manual operation. The positive stop can be adjusted for the desired size and the mechanism operated manually rather than waiting for the automatic downfeed at table reversals. The positive stop pin can be located on either side for grinding the front or back of a slot.

Vertical Rapid Positioning Arrangement

Powered by a 1/4 hp (.187 kw) motor, this arrangement permits rapid vertical positioning at the rate of 40 ipm (1 m/min). A brake-type motor is used for fast stop. Control pushbuttons are located at the control station at the right of the machine.

Positioning by power requires, first, pushing the control knob located between the elevating and cross feed handwheels, then pressing the proper pushbutton to move the wheel up or down. The wheel travels as long as the button is pressed. The full travel range is 14 3/4" (375 mm). The elevating handwheel must be disengaged to activate the vertical positioning control.

Automatic Cross Feed Reversing Arrangement

Available for machines with power cross feed, this arrangement provides a convenient means of automatic cross feed reversal. Reversal continues until the cycle is stopped by the operator. The set of adjust-

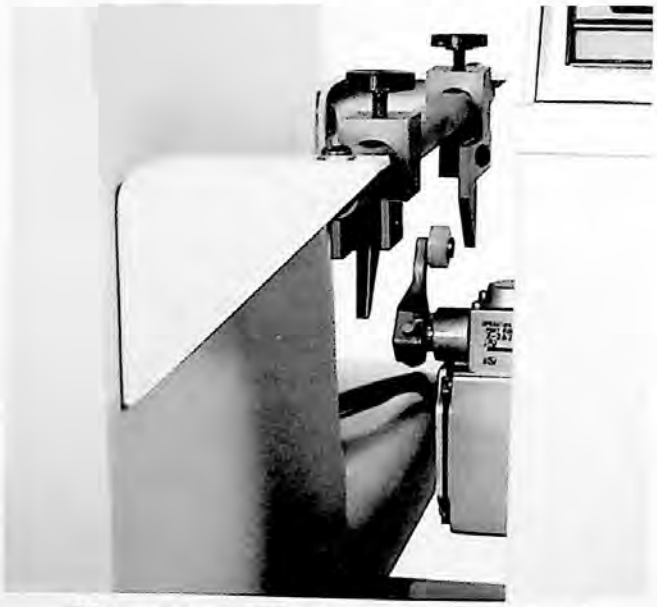


Fig. 2I. Automatic cross feed reversing arrangement.

able trip dogs is located on the right side of the upright. The controls are located at the control station at the right front of the machine. Return to hand cross feed operation can be made by switching the Selector control to the Manual position.

Vertical Position Indicator

This Indicator greatly reduces setup time by permitting rapid, accurate vertical positioning of the grinding wheel. This eliminates the time-consuming task of "feeling" for the workpiece. The Indicator is adjustable over the entire vertical range of the grinding wheel.

Wheel position is indicated by a dial indicator precisely adjusted with a micrometer. Position is easily observed by noting the dial indicator reading.

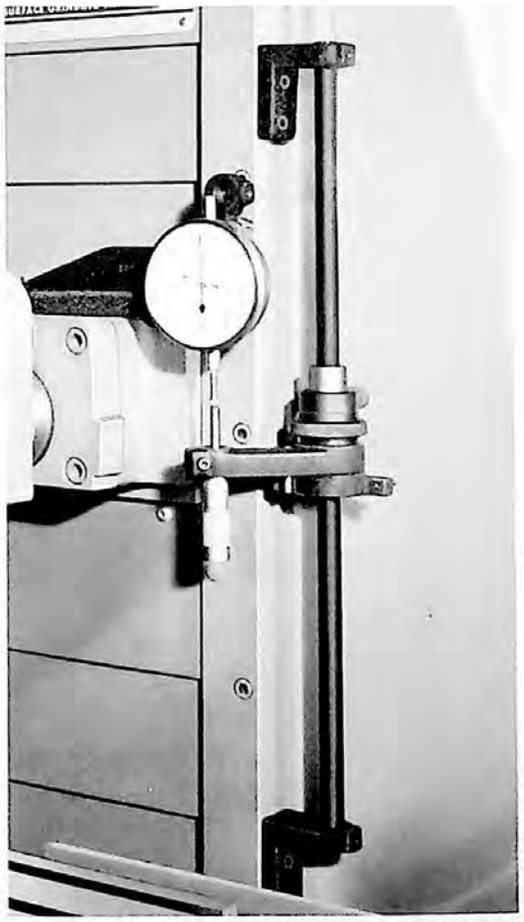


Fig. 3I. Vertical position Indicator.

Separate Control for Spindle Motor

This arrangement provides for independent control of spindle power and table power by use of the two-position selector knob furnished with it. In one position, the spindle can be stopped without shutting down the hydraulic system. This provides a "dead wheel" for safety during setup, and the table can still be positioned by power. The other position of the selector provides normal, simultaneous operation of both spindle and hydraulic system motors.

Extra Vertical Capacity Parts

These parts (available for direct drive machines only) increase the vertical capacity of the machine by providing a 4" (1000 mm) raising block. This increases the height of work ground to 19 1/2" (495 mm) with a 7" (177 mm) wheel. This modification is built into the machine at the factory when specified.

Wet Grinding Attachment

With the Wet Grinding Attachment, coolant is supplied to the wheel

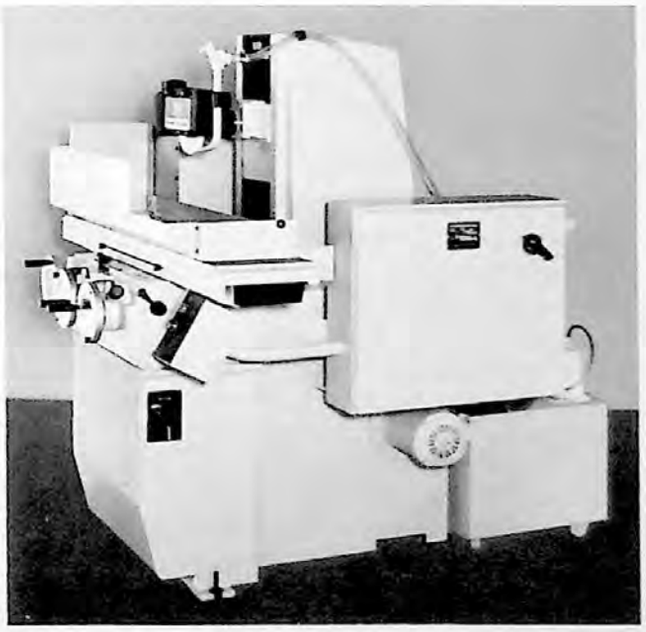


Fig. 4I. Wet Grinding Attachment

through a nozzle and flexible tubing from a 1/8 hp (.09 kw) motor-driven centrifugal pump mounted in the supply tank. A valve adjacent to the nozzle controls the rate of flow, and an adjustable splash guard, mounted on the opposite side, deflects the coolant.

The machine table is surrounded by guards that protect both the machine and operator from coolant spray. Coolant collects in the table channels and is delivered to a trough in the bed at the rear of the table. It is then discharged into troughs at the side of the upright base and returns to the supply tank through a flexible hose. The 30 gal. (113.56 liter) floor type tank is of welded steel and is fitted with casters. Removable baffles provide for efficient settling.

The pump motor connects to the back of the electrical cabinet and is started and stopped with the machine Start-Stop pushbuttons.

Mist Coolant Arrangement

This arrangement combines compressed air with coolant to develop a mist that evaporates on contact with the work, cooling as it evaporates, and provides full-time visibility of the work.

A solenoid valve connected to the machine's electrical circuit synchronizes the start of the mist stream with the start of the machine.

Precision control of the mist is provided by a needle valve on the jet. This valve permits accurate adjustment from a very fine mist to a heavy spray. There is never any flooding or "sputtering". The mist is generated at the end tip of the jet. There is no condensation in tubes, and no dripping or spurting of coolant when starting or stopping.

Exhaust Attachment

This attachment, meets OSHA standards for dust control, removes grit and dust-laden air from the region of the grinding operation by suction and separates out the foreign matter, leaving the air well cleaned.

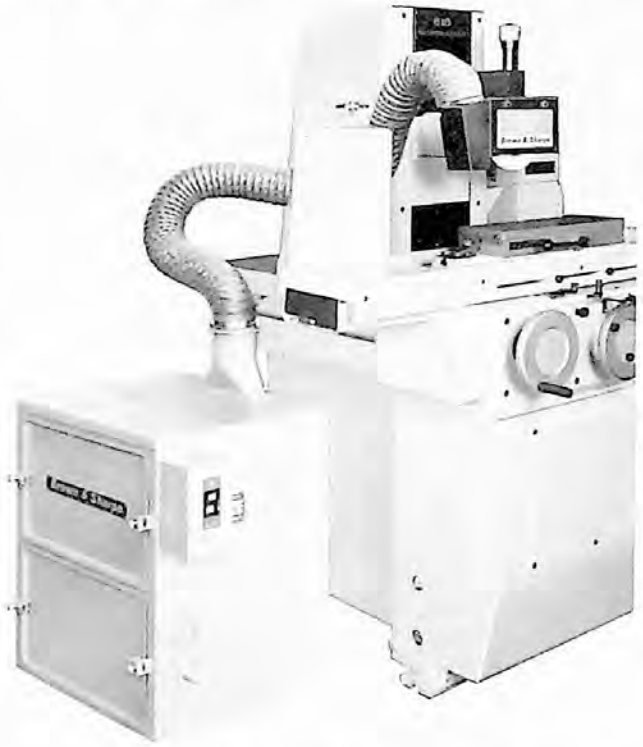


Fig. 5I. Exhaust Attachment.

A 3/4 hp (.56 kw) motor-driven fan is mounted on the clean air side of the unit. Dust-laden air, up to 420 cfm (11.89 cu. m/m), drawn through a flexible hose from an exhaust nozzle attached to the wheel guard, must pass through the filters before it reaches the fan. This prevents fan loading and excessive wear, and saves the time and cost of repairs.

Grit, dust and other particles exhausted from the work area are deposited in the base of the collection chamber or stopped by the filters. The fabric filtering area totals 30 square feet (2.787 square meters), providing an exceptionally high collection efficiency for particles of all sizes. This efficiency is up to 99.75% for particles as small as 1.0 micron.

Most of the dust and larger particles settle directly in the pull-out dust drawer. The fine dust which collects on the outside of the fabric filters is easily dislodged by operating the filter shaker lever.

The attachment has a 4" (101.6 mm) inlet and a capacity of 420 cfm (11.89 cu. m/m) at a velocity of 4823 fpm (1470 m/m). Floor space required is 19 5/16" x 22 3/8" (490.5 mm x 568.3 mm) and the cabinet height is 26 11/16" (677.9 mm).

Optional equipment for Exhaust Attachment:

Independently Supported Hose Assembly - Available at extra cost in place of standard hose and nozzle regularly furnished for attachment to wheel guard. Suspension brace holds hose in operating position. Intake end is fitted with air scoop which can be readily positioned next to wheel for efficient collection of dust and grit.

Exhaust Silencer - For conditions where the utmost in silent operation is required, this supplementary silencer is available at extra cost. It fits over the air stream outlet and does not increase floor space requirements.

High Speed Surface Grinding Attachment

Slots and other surfaces which do not permit the use of a wheel of large diameter can be rapidly and economically ground with this attachment. The attachment is readily applied to the machine, and drives small grinding wheels at the necessary high surface speeds.

The attachment spindle runs at 15,000 rpm when driven from a machine spindle having Oriflex drive, and at 18,000 rpm when driven from a direct drive spindle (running at 3600 rpm).

The attachment fits on the machine spindle housing, and can be

Fig. 6I. High Speed Surface Grinding Attachment.

used in practically any angular position around the spindle. With the attachment spindle in the lowest position, the maximum vertical distance between center of attachment spindle and top of machine table is 12" (305 mm). The spindle is mounted on two pairs of super-precision ball bearings and is driven from a pulley mounted on the machine spindle. Belt tension adjustment is by means of an eccentric sleeve in the attachment body.

In changing wheels or arbors, a spring-loaded plunger in front of the attachment body above the spindle can be pushed in to hold the spindle from rotating. The spindle hole and arbor shank must be perfectly clean before the arbor is inserted, and the arbor must be seated firmly in the spindle. All arbors used have a left-hand thread. A cold arbor should never be placed in a warm spindle, since, when the arbor expands (or the spindle cools and contracts), the taper fit will be so tight that removal of the arbor will be difficult.

Wheel arbors and grinding wheels are furnished at extra cost. Stock sizes are listed on page I6. The exacting limits and fine finish demanded of this equipment require extreme accur-

Arbor Number	Grinding wheel size - diam. x thick. x hole		Distance, rear face of grinding wheel to end of Attachment spindle -	
	Inches	mm	Inches	mm
2103*	1/2 x 1/4 x 3/32	12.7 x 6.35 x 2.38	13/16	20.64
2105*	1/2 x 1/4 x 3/32	12.7 x 6.35 x 2.38	1 3/16	30.16
2107*	1/2 x 1/4 x 3/32	12.7 x 6.35 x 2.38	1 9/16	37.69
2109	7/8 x 1/4 x 1/4	22.22 x 6.35 x 6.35	1 3/4	44.9
2111	1 1/4 x 3/8 x 5/8	31.75 x 9.53 x 15.88	1 3/4	44.9

* Used with No. 2125 Collet, furnished at extra cost

acy in the taper fit between spindle and wheel arbor. Therefore, we strongly recommend that all wheel arbors be furnished by us to assure the utmost in precision and finish.

Power Truing Arrangement - Over-the-Wheel

This arrangement, mounted directly over the wheel, greatly reduces the time and effort required for wheel dressing. It provides a smooth, powered traverse of the diamond, at uniform speed, across any grinding wheel up to 1" (25 mm) in width.

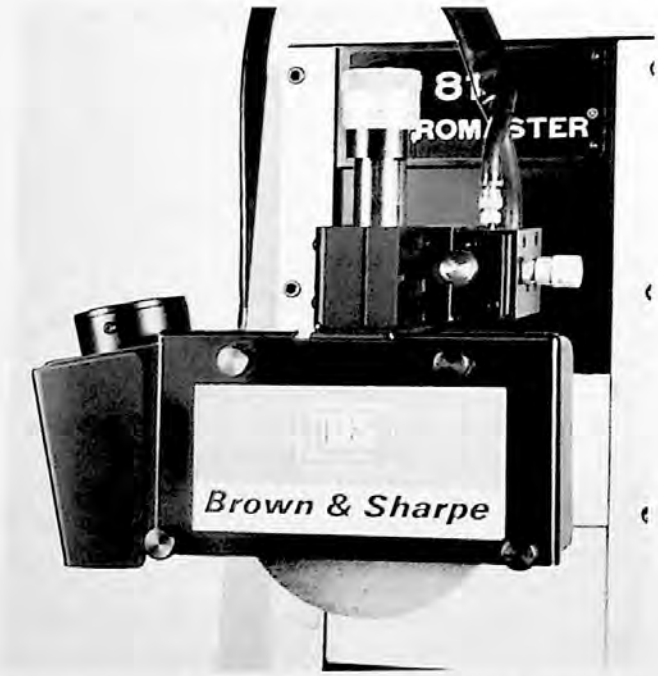


Fig. 7I. Over-The-Wheel Power Truing Attachment.

The traverse is hydraulically actuated by pushbutton, and the truing rate is adjustable from 2 to 20 ipm (50 to 500 mm/min). The total radial feed adjustment is 3" (76 mm), with 1" (25 mm) of this movement provided by the feed screw, which permits micrometer adjustment in increments of .0001" (.0025 mm).

The diamond (approximately 1 carat) in a mounting is available at extra cost.

Over-the-Wheel Manual Truing Arrangement

With this arrangement, wheel dressing for the majority of routine jobs becomes a simple operation, saving many of the steps necessary in other methods of truing. The diamond is held in a traversing ram mounted above the wheel, which is operated manually with the lever on the right side. It will true wheels up to 1" (25 mm) wide. The diamond has a total vertical feed adjustment of 3" (76 mm). One inch (25 mm) of this is provided by the feed screw, which permits micrometer adjustments in increments of .0001" (.0025 mm).

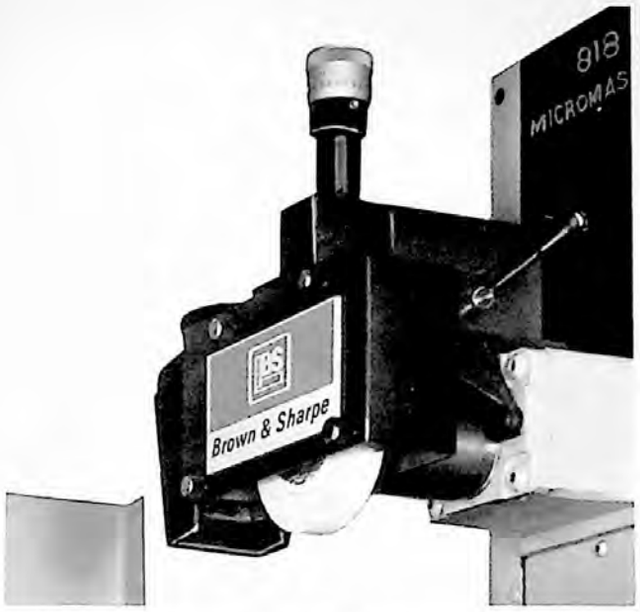


Fig. 8I. Over-The-Wheel Manual Truing Attachment.

eter adjustment in increments of .0001" (.0025 mm).

The diamond is traversed across the wheel by use of the lever. A pull moves the diamond forward and a push retracts it. The truing speed is controlled by the operator; the slower the lever movement, the finer the truing cut.

In using this arrangement, it is essential that the stroke of the ram is parallel with the table. This is checked as follows:

1. True the wheel from the table and grind a test block.

2. Stop the table and true the wheel with the over-the-wheel truing arrangement.

3. Feed the rotating wheel down slowly until it contacts the work, then "read" the witness marks on the surface of the work. (See Fig. 9I.)

4. If the wheel makes a full width cut, the ram stroke is parallel to the table. If the wheel cut is stronger at the front or back, adjust the ram stroke to correct it.

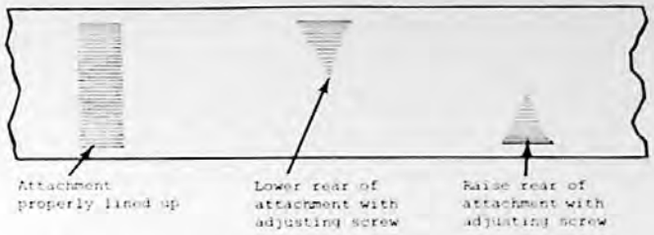


Fig. 9I. Wheel marks on surface of test block.

After the initial check and adjustment, wheel truing is fast and accurate. The diamond is fed down by turning the micrometer dial, then passed across the wheel. After the wheel is trued, it is lowered an amount equal to the truing cut, as indicated on the dial. This brings the surface of the wheel into the same position relative to the work surface as it was before truing.

The diamond (approximately 1 carat) in a mounting is available at extra cost.

Radius and Angle Wheel Truing Attachment

This attachment provides a ready means of forming wheels with accurate convex or concave outlines up to 1" (25.4 mm) in radius and face angles up to 90° (1.57 radians) either side of zero, and permits forming combinations of radial and angular shapes.

The base of the attachment carries a swivel platen upon which is mounted a slide which can be moved horizontally by handwheel. A gib and adjusting screw provide means of compensating for wear in the slide. The base is keyed for accurate alignment.

To form concave or convex outlines, clamp the diamond tool (diamond not furnished) in the upright parallel to the slide as shown in Fig. 10I, locating the diamond point by means of the diamond tool setting gage (turned upward 180° (3.14 radians) from the position shown). Adjust the slide by handwheel to the desired

radius as shown by the scale on the side, setting the slide to the right of center to form a convex shape on the wheel and to the left of center to form a concave shape. Tighten the clamping screw on the back of the slide (not visible in illustration) to lock the adjustment, and pass the diamond across the wheel by swiveling the attachment on its base.

To true a wheel to an angle, swivel the slide to the desired setting as indicated in degrees by the scale on the base and tighten the clamp screw in front of the base. Clamp the diamond tool in the upright at right angles to the slide and pass the diamond across the wheel by running the slide back and forth by handwheel.

In either case, to obtain the desired shape adjust the height of the spindle head to bring the center of the spindle horizontal with the diamond point.

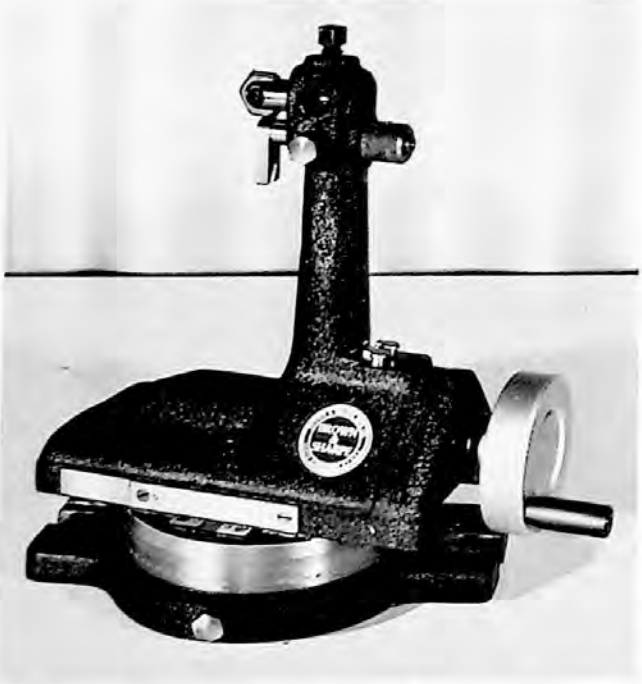


Fig. 10I. Radius and Angle Wheel Truing Attachment. The slide is clamped at the required radius, the diamond tool is set by the gage just below it and the slide is swiveled to form the wheel.

Continuous Radius and Tangent Wheel Truing Attachment

This attachment is designed to form, with one continuous movement of the diamond, accurate radii on grinding wheels with accurate tangents at either or both sides of the radii. The forms possible are described below:

Convex form on wheel:

A - Radii up to 1/2" (12.7 mm) can be used when forming convex shape on wheel.

B - Tangent at front of wheel can be in any direction from parallel to the side of the wheel to 110° (1.92 radians) away from the side.

C - Tangent at rear of wheel can be in any direction from parallel to the side of the wheel to 110° (1.92 radians) away from the side.

D - Included angle of tangents can be from 0 to 180° (3.14 radians).

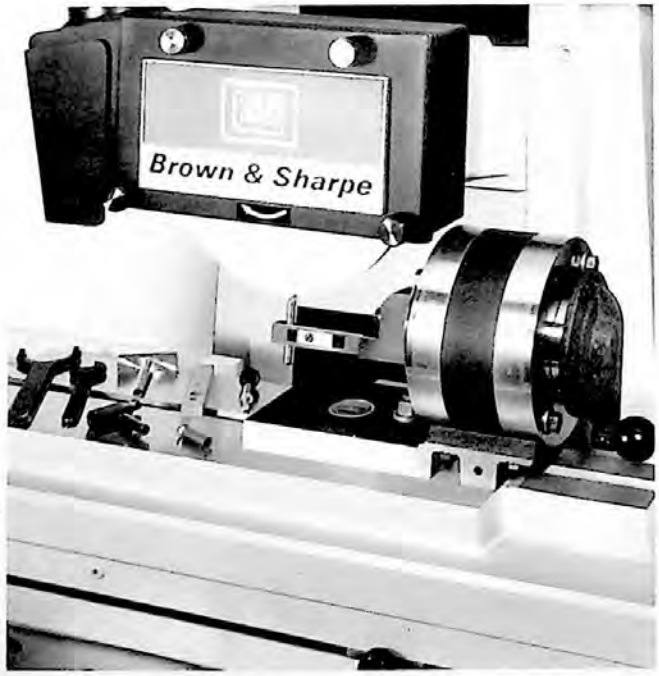


Fig. 12I. Continuous Radius and Tangent Wheel Truing Attachment.

Concave form on wheel:

A - Radii from 1/32" (.79 mm) to 1" (25.4 mm) can be used when forming concave shape on wheel.

B - Tangent at front of wheel can be in any direction from 70° to 180° (1.22 to 3.14 radians) away from the side of the wheel.

C - Tangent at rear of wheel can be in any direction from 70° to 180° (1.22 to 3.14 radians) away from the side of the wheel.

D - Included angle of tangents with radius of 3/8" (9.52 mm) or less can be from 0° to 180° (3.14 radians). With radius over 3/8", the included angle of tangents can be from 90° to 180° (1.57 to 3.14 radians).

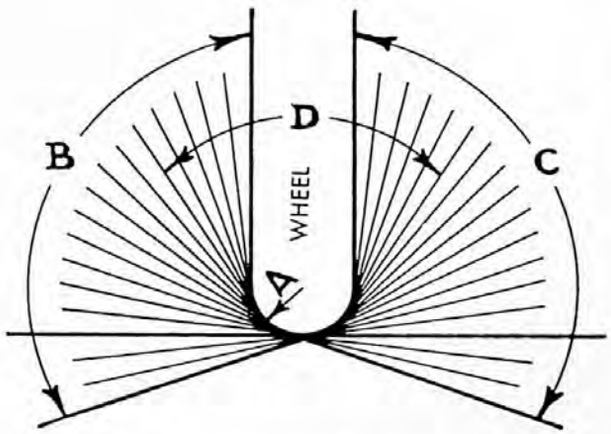


Fig. 13I. Convex form on wheel.

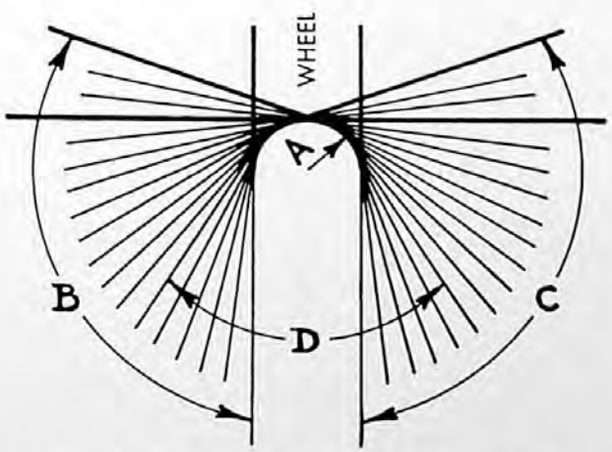


Fig. 14F. Concave form on wheel.

The angles of tangents are independent of each other. On a concave shape having a radius over 3/8" (9.52 mm), the included angle must be 90° (1.57 radians) or more. Concave radii less than 5/32" (3.97 mm), and all concave radii 3/8" (9.52 mm) or 1 less having the included angle of the tangents less than 90° (1.57 radians), require diamond tool holders other than the one furnished. (These diamond tools should be the same or similar to the "HC Series" as made by the Wheel Truing Tool Co. of Detroit, Mich.).

The attachment is firmly clamped to the machine table by a single T-bolt. Accurate alignment is assured by two reversible tongues for T-slots 1/2" or 9/16" (12.7 or 14.29 mm) wide. These tongues are easily removed when the attachment is to be used on a magnetic chuck.

When truing a convex form, the angle of the tangent at the front of the wheel is controlled by the angular setting of the adjustable plate at the left side of the attachment body; the angle of the tangent at the back of the wheel is controlled by the setting of the plate at the right of the body.

When truing a concave form, the left-hand plate controls the rear tangent and the right-hand plate the front tangent. Verniers on the plates and matching scales on the attachment body facilitate the setting. Two clamp nuts on each plate maintain the angular setting. A gage is provided, which, used in conjunction with a micrometer, permits setting the diamond to form an accurate radius on the grinding wheel.

After the attachment is properly set, the diamond is brought into contact with the grinding wheel and the wheel is accurately formed to the desired shape by turning the easily operated crank at the right.

Detailed operating instructions are furnished with the attachment.

This attachment is not recommended for use where coolant may enter its bearings.

Variable Spindle Speed

Permits constant control of surface speed by compensation for change as wear reduces diameter of grinding wheel. Allows adjustment of spindle speed up to 6000 sfm (1829 m/min) for maximum efficiency on different materials. Speed can be easily read on the indicator provided. A safety interlock prevents over-speeding of wheels. Solid state, plug-in modules. JIC, NEMA 12 enclosure.

Fine Cross Feed Knob

For maximum, precise control of cross feed operations. Wide spaced graduations permit easy reading of changes in .0001" (.002 mm) increments. This arrangement is coupled to the Cross Feed Handwheel. Non-reflecting, black finish.

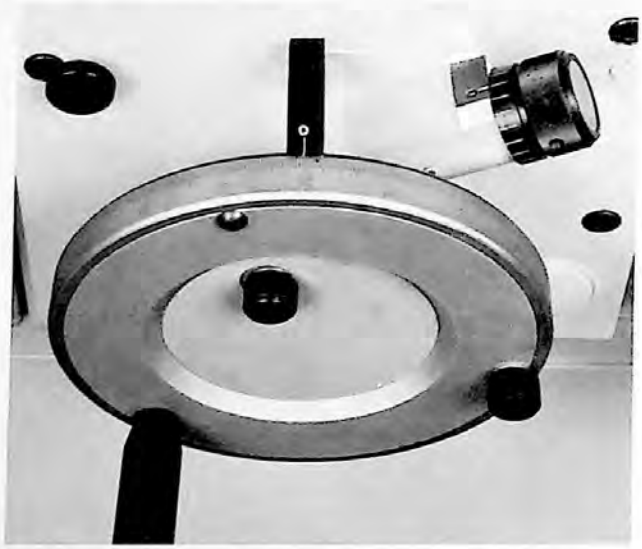


Fig. 15I. Fine Cross Feed Knob.

Illuminated Dust Guard

This unit fits over the dust guard regularly furnished on the left end of the machine table. Two 6-watt flourescent tubes mounted behind frosted safety glass provide an excellent bright background for such jobs as form grinding, etc.

Fig. 16I. Illuminated Dust Guard.

Isolation Mountings

This set of three mounts eliminates the need for expensive machine foundations where external vibrations are a problem. A machine set on these mountings is isolated from external vibrations such as those present when a machine is located on an upper floor of a multi-story building, or located near vibration-causing machinery.

The use of the Mountings raises the machines approximately 3/4" (19 mm) off the floor.

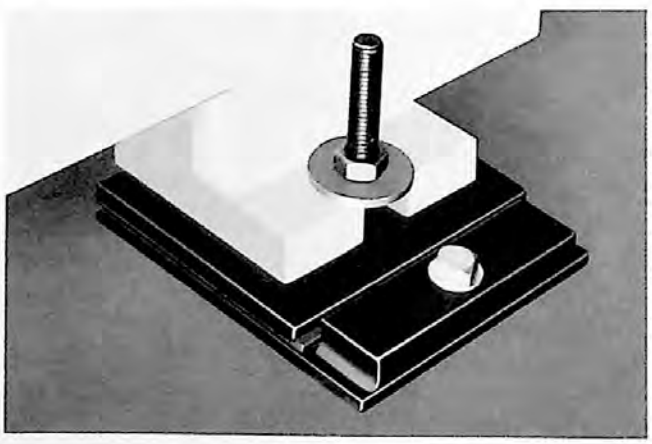


Fig. 17I. Isolation Mount.

Work Positioning Table

For monitored positioning of the workpiece. Speeds and simplifies precise transverse adjustment for slot grinding, rack teeth and broach teeth grinding, and for grinding splines, keyways, tool and die sections, etc. Adjustable dial indicator has range of 1" (25 mm) with .0001" (.002 mm) graduations.

Features engineered for precision performance include accurately ground lead screw, hardened and ground dovetail ways, and patented non-distorting table top lock. Provides gage block stage. Accommodates Magnetic Chucks up to 6" x 12" (152 mm x 304 mm).

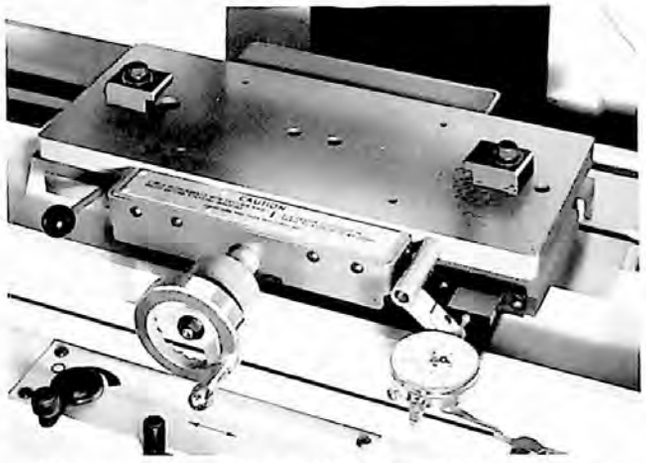


Fig. 18I. Work Positioning Table.

4 3/4 Inch Index Centers

These Index Centers permit accurate indexing of the more common circular divisions and facilitate the grinding of taps, reamers, formed cutters and similar work. The Centers are clamped in position by T-bolts and are aligned by tongues which fit the table T-slots.

A spring-loaded locking pin on an adjustable arm, together with six rows of holes in the face of the combined index plate and worm wheel, provide for indexing all divisions from 2 to 14 and all even-numbered divisions from 18 to 28. The index plate can be turned by the worm, or the worm can be thrown out of mesh and the index plate turned by hand. To disengage the worm, loosen the adjacent clamp screw and swing the worm downward.

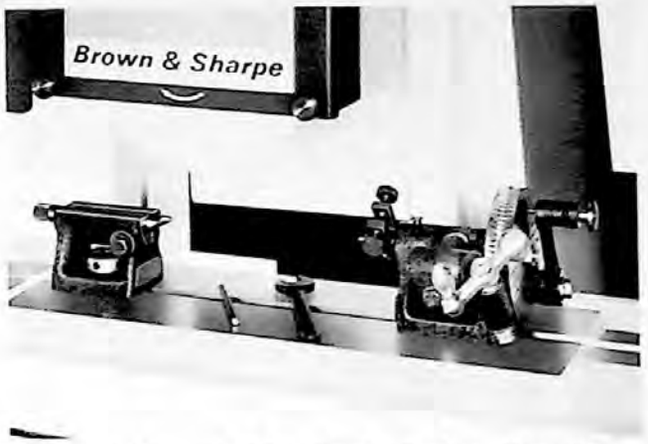


Fig. 19I. 4 3/4 Inch Index Centers.

In using the Index Centers for sharpening formed cutters or similar work having radial tooth faces, first turn the cross feed handwheel to bring the face of the grinding wheel in line with the centers. Then, with the work mounted between centers, disengage the index pin and turn the worm to feed the face of a tooth into the grinding wheel, feeding the work a small amount and running the table back and forth by hand in successive steps until that tooth is properly sharpened. Next, loosen the index pin arm, insert the pin in a hole in the proper circle and securely clamp the arm.

In sharpening the rest of the teeth, where a considerable mount of stock is to be removed from each tooth face, feed the work to the grinding wheel by means of the worm to take the necessary number of successive cuts on each face until the index pin enters the proper hole. In case the grinding wheel requires dressing before all of the teeth are sharpened, readjust the position of the grinding face of the wheel relative to the index centers after dressing the wheel. Moving the spindle slide upright to bring the grinding wheel into contact with the face of the last tooth ground is generally sufficient. After sharpening the remainder of the teeth, a

final adjustment of the spindle slide upright may be necessary for required accuracy, after which a light finishing cut all around will compensate for errors due to wheel wear.

The Centers as furnished swing work up to 4 3/4" (120 mm) diameter. Used with raising blocks (available at extra cost), they will swing work up to 8 1/4" (210 mm) diameter. The reversible tongues fit T-slots 1/2" or 9/16" (12.7 mm or 14.29 mm) wide.

Magnetic Chucks

The Brown & Sharpe rectangular model Permanent Magnet Chucks provide a quick, easy means of holding a variety of ferrous work for surface grinding. A 180° (3.14 radians) movement of the control lever turns the chuck on or off. Since the Chuck does not use electric current, it can be left turned on for as long as necessary without heating. Wiring, switches, generators, etc., are not required. The special alloy magnets retain their holding power indefinitely. These Chucks are available in two types:

"Wide pole" Magnetic Chucks are the type most commonly used. For grinding where the tolerance is over .0003" (.0076 mm) and where large and thick parts predominate, this type will prove satisfactory. Auxiliary

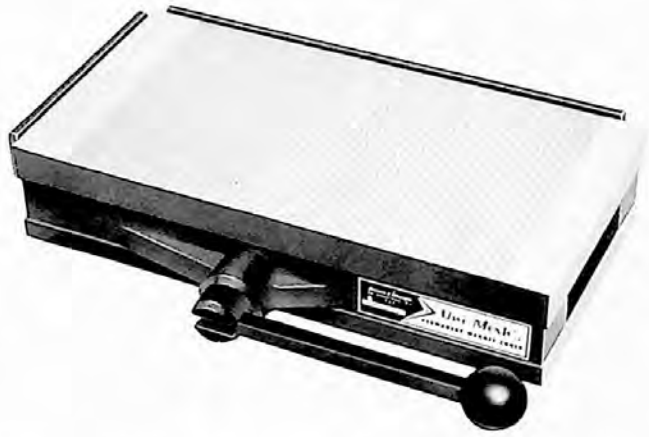


Fig. 20I. Brown & Sharpe Permanent Magnet Chuck.

The rectangular Permanent Magnet Chucks available are as follows:

Chuck No.	Working Surface, inches (mm)	Height of Chuck, inches (mm)	Shipping Weight, lbs. (kg)
510-6	5 x 10 (125 x 250)	2.6 (65)	32 (14)
510-7	5 x 10 (125 x 250)	2.6 (65)	32 (14)
512-6	5 x 12 (125 x 300)	2.6 (65)	38 (17)
612-6	6 x 12 (150 x 300)	2.6 (65)	46 (21)
614-6	6 x 14 (150 x 350)	2.6 (65)	53 (24)
618-6	6 x 18 (150 x 450)	2.6 (65)	69 (31)
618-7	6 x 18 (150 x 450)	2.6 (65)	69 (31)
818-6	8 x 18 (200 x 450)	2.6 (65)	92 (41)

Nos. ending - 6 have Unimesh top plates with .165" (4.2 mm) pole spacing.
Nos. ending - 7 have Micro-Mesh top plates with .030" (.8 mm) pole spacing.

top plates are available for holding smaller work.

The Micro-Mesh Permanent Magnet Chucks are designed for high precision performance in grinding parts that are small or thin to tolerances of .0003" (.01 mm) or less. Their closely spaced poles serve equally well for holding larger, thicker parts.

For highest accuracy in grinding work parallel, the top surface of the Chuck should be ground each time it is mounted on the machine. The Chuck should be turned On so that it will hold magnetically to the table surface. Only a minimum amount of metal should be removed, usually about .0002" (.005 mm).

If the machine is equipped for it, wet grinding is preferable when using a Magnetic Chuck. The coolant reduces the possibility of distortion in the top plate which might be caused by the heat from grinding.

Two removable stop plates are furnished with each chuck, one for the back and one for the left-hand end, which can be adjusted vertically to suit the work.

Electromagnetic Chucks can also be furnished together with a rectifier and neutrifier. Descriptive information will be sent on request.

Neutrofier

Neutrofiers are used to overcome problems encountered by shops where the work is predominantly ferrous metal parts. They successfully neutralize both swarf and workpiece to assure the finest finish. The Neutrofiers available are free-standing and self-contained.

5" and 10" Sine Plates

Simple and Compound

These Sine Plates offer, at surprisingly low cost, reliable means for establishing precise angles for surface grinding, and for tool-making and inspection purposes as well. With an overall accuracy within .0002" (.005 mm), they give gage block accuracy to angular settings.

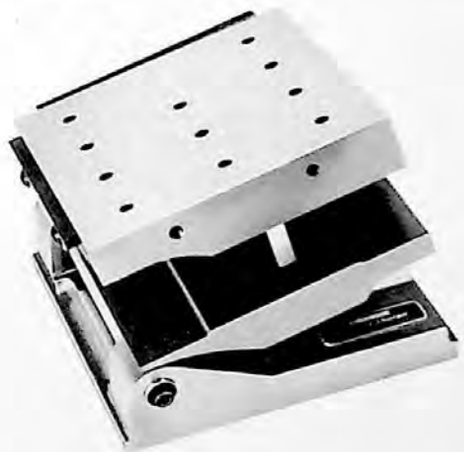


Fig. 21I. Compound Sine Plate.

Specifications for Simple and Compound Sine Plates

Size	Type	Working surface, inches	Working surface, (mm)	Height, set at 0° inches	Height, set at 0° (mm)
5"	Simple	3 1/2 x 6	(9 X 152)	1 15/16	(49)
10"	Simple	6 x 11	(152 X 279)	2 9/16	(65)
5"	Compound	6 x 6	(152 X 152)	3 3/16	(81)
10"	Compound	6 x 11	(152 X 279)	3 9/16	(90)

Made of normalized steel, case hardened and seasoned, they have a glass-like finish on bottom, top and sides. They are furnished with a side plate and end plate, held in place by knurled-head screws. The top plate has tapped holes in its sides, ends and top for the application of clamps or other holding devices.

Both Simple and Compound Sine Plates are available. The Compound Plate (Fig. 21I) is ideal for grinding compound angles. The lower hinge on the Compound Plate can be furnished on the opposite end to that illustrated at no extra cost.

These Sine Plates are made of steel, case hardened and seasoned, and have glass-like finish on bottom, top and sides. A side plate and an end plate are furnished, held in place by knurled-head screws.

Both simple and compound Perma-Sines are available. The compound model (illustrated) is particularly suited to grinding complex angles. The lower hinge on the compound plate can be furnished on opposite end to that illustrated at no extra cost.

5" and 10" Perma-Sines
Permanent Magnet Sine Plates - Simple and Compound

Perma-Sines offer all the capabilities of the Sine Plates described above plus the added advantage of a Permanent Magnet working surface. Their overall accuracy is within .0002" (.005 mm).

No clamps or special holding fixtures are required. Magnetic holding power is turned on or off by the movement of a lever. The closely spaced poles in the magnetic plate are ideal for holding small or thin work.

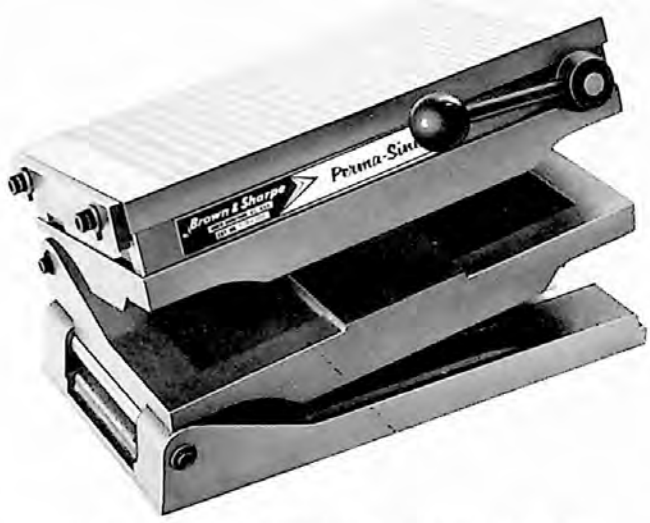


Fig. 22I. Compound Perma-Sine.

Specifications for Simple and Compound Perma-Sines.

Size	Type	Working Surface, inches	(mm)	Height, set at 0° inches	(mm)
5"	Simple	6 x 6	(152 X 152)	3 29/32	(99)
10"	Simple	6 x 12	(152 X 305)	4	(102)
5"	Compound	6 x 6	(152 X 152)	4 7/8	(124)
10"	Compound	6 x 12	(152 X 305)	5 3/8	(137)

Precision Grinding Vise

This vise is ruggedly designed to hold work rigidly for close- tolerance operations. All work contacting surfaces are precision ground. A unique jaw cam prevents up-lift of workpiece under pressure. Sides and jaws are square and parallel within .0002" (.005 mm). The jaw opening takes work up to 4" (101 mm). The jaws are 2 1/2" (63 mm) wide and 1" (25 mm) deep.

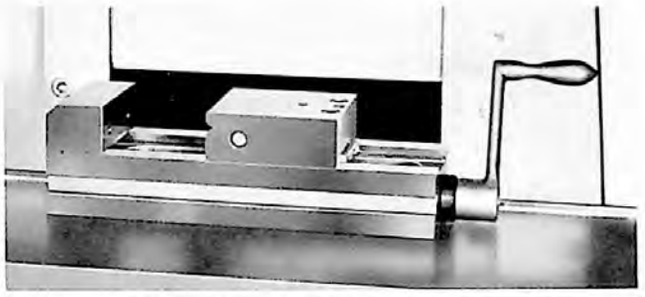


Fig. 23I. Precision Grinding Vise.

No. 202 Adjustable Swivel Vise

The No. 202 Vise can be clamped to the table with the jaws at any horizontal angle to the table T-slots. The jaws can also be tilted in a vertical plane to any angle up to 45° (.79 radians) each side of horizontal. The latter setting is indicated by a scale graduated in degrees and is clamped by the nut at the right as illustrated below.

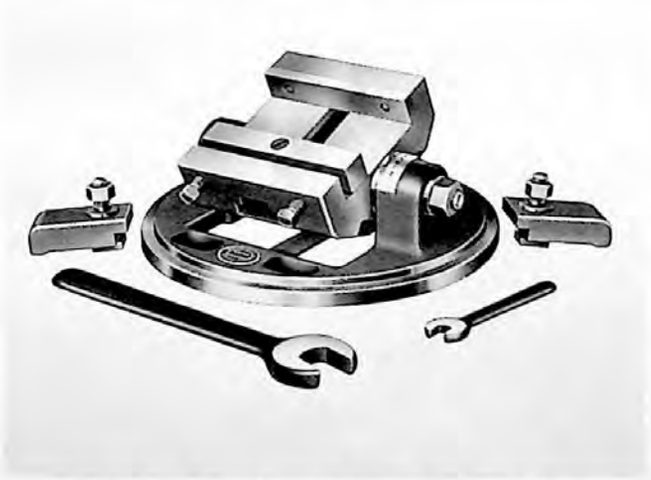


Fig. 24F. No. 202 Adjustable Swivel Vise.

The hardened tool steel jaws are 5" (127 mm) wide, 1" (25 mm) deep and open 2 3/4" (69.9 mm). The movable jaw is opened and closed by the two screws at the front. With the jaws horizontal, the distance from bottom of base to top of jaws is 4" (102 mm).

Work Light

The shade of this light is shaped and vented to dissipate heat, keeps cool to the touch. The "tension control wrist" prevents sag regardless of repeated turning and flexing. A replaceable reflector prevents heat transfer and permits restoring original efficiency if prolonged spatter build-up cuts light output. A new reflector can be easily snapped in.

The overall reach of the arm is 30" (760 mm). A standard 60 watt bulb is recommended (not furnished). The lamp is furnished with a mounting bracket, 6 ft. (1.8 m) of three-conductor, oil-resistant cord and three-conductor receptacle - ready to plug into 110V circuit.

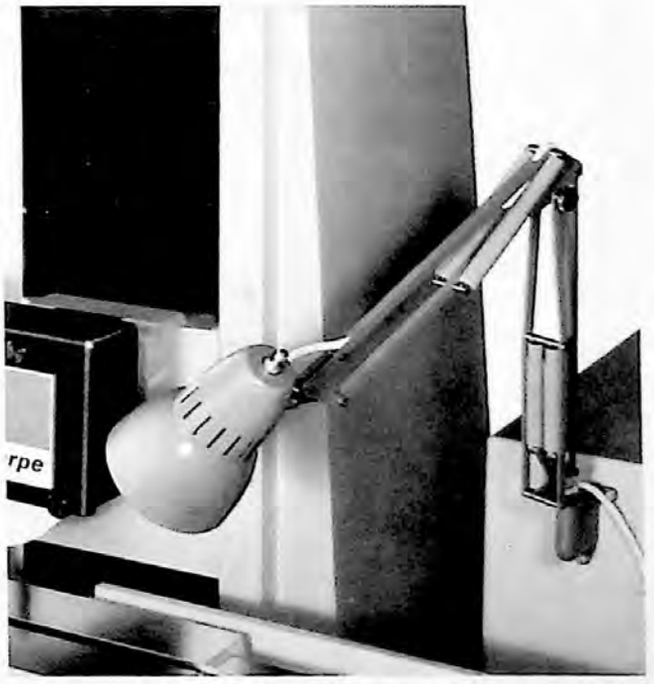


Fig. 25F. Work Light

The Brown & Sharpe line includes the following:

Machining Centers — Semi-Automatic, Automatic, Tape-Controlled.

Automatic Turning Machines — Ultramatic Screw, Ultramatic Forming and Cutting-Off, Ultramatic Chucking, Tar-M/S Programmed Turning, Decomat Programmed Turning.

Grinding Machines — Universal, Surface, Universal and Tool.

Coordinate and Diameter Measuring Centers

Precision Tools and Gages

Electronic Measuring Equipment

Gage Blocks

Cutting Tools — High Speed Steel, Carbide.

Arbors, Collets and Adapters

Screw Machine Tools

Permanent Magnet Chucks — Rectangular, Rotary.

Vises — Plain, Flanged, Swivel, Toolmakers' Universal.

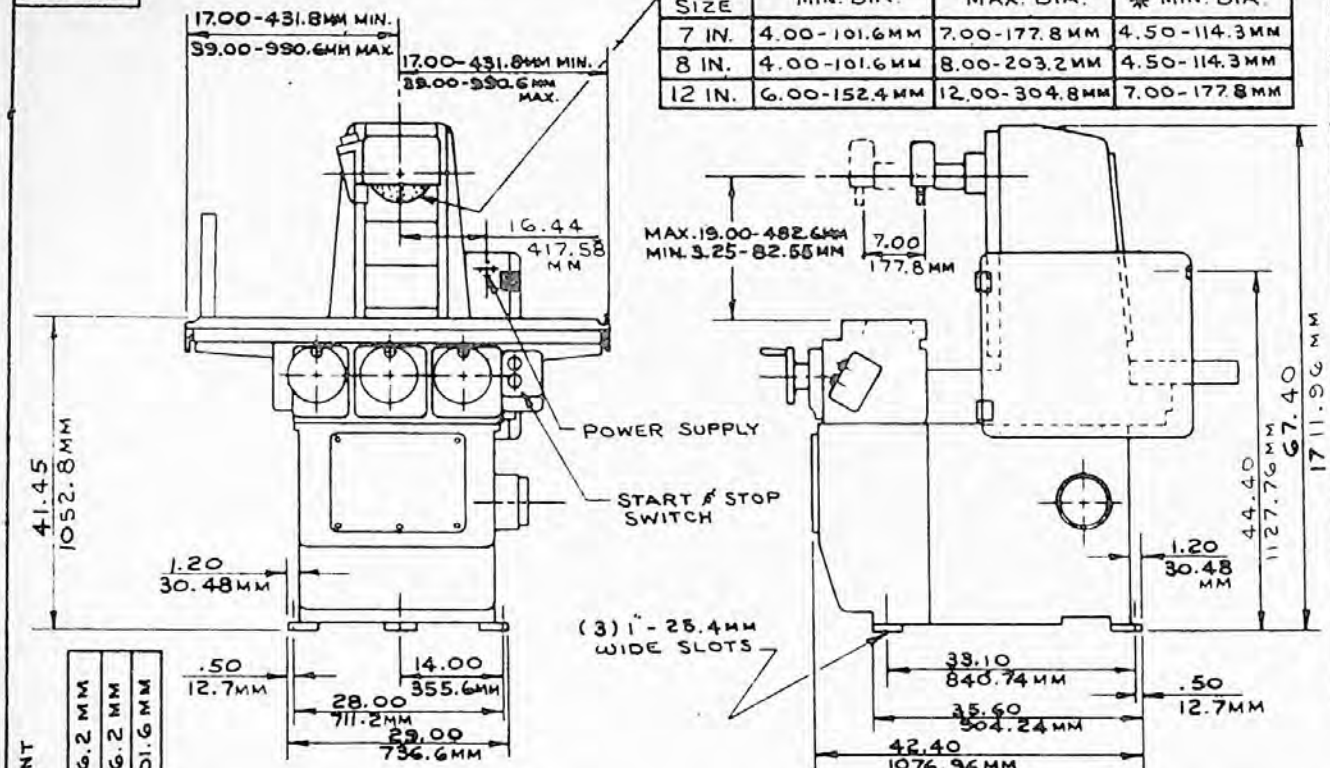
Hydraulic Products — Pumps, Valves, Power Units.

BROWN & SHARPE MFG. CO.
Precision Park, North Kingstown, R. I., U. S. A. 02852

FORM 1107 DR

DATA SHEET AND FLOOR PLAN	BROWN & SHARPE MFG. CO. NORTH KINGSTOWN, R. I., U. S. A.	TYPE OF MACHINE: NO. 618 POWER FEED & HAND FEED SURFACE GRINDING MACHINE.	MACHINE SERIAL NO.: 523-618-	USER'S MACHINE NO.	DRAWING NO.: 23-99990-42

60 HZ.



WHEEL SIZE	MIN. DIA.	MAX. DIA.	* MIN. DIA.
7 IN.	4.00-101.6MM	7.00-177.8MM	4.50-114.3MM
8 IN.	4.00-101.6MM	8.00-203.2MM	4.50-114.3MM
12 IN.	6.00-152.4MM	12.00-304.8MM	7.00-177.8MM

WHEEL SPEEDS

SPIN. TYPE	SIZE	R.P.M.	FEET PER MIN.	METERS PER MIN
ORI-FLEX	8 INCH 203.2MM DIA.	2866	6000	1829
DIR. DR 1	7 INCH 177.8MM DIA.	3600	6597	2011
DIR. DR. 2	7 INCH 177.8MM DIA.	3600	6597	2011
DIR. DR. 3	12 INCH 304.8MM DIA.	1800	5655	1724

TYPICAL

TABLE FEEDS (POWER FEED MACH. ONLY)
INFINITELY VARIABLE
5 FT. 1.52 M PER MIN. TO 100 FT. 30.47 M PER MIN.

VERTICAL HAND FEED OF WHEEL
.0001 INCH .0025 MM STEPS

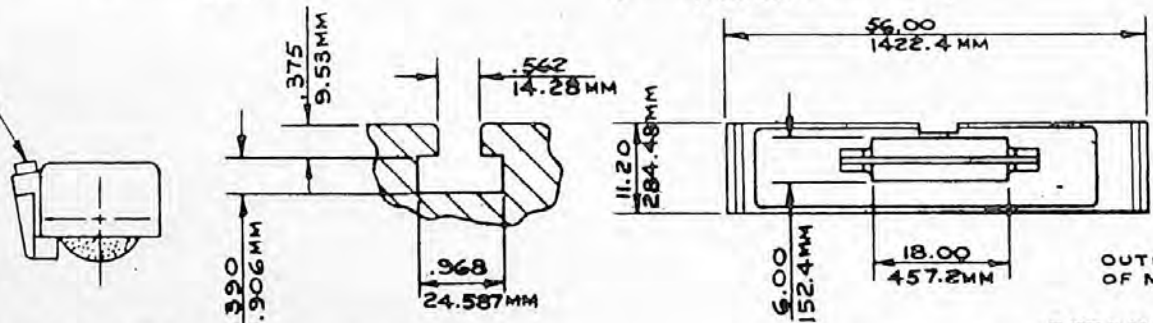
CROSS FEEDS (POWER FEED MACH. ONLY)
INFINITELY VARIABLE
.010 INCH .254 MM TO .250 INCH 6.35 MM

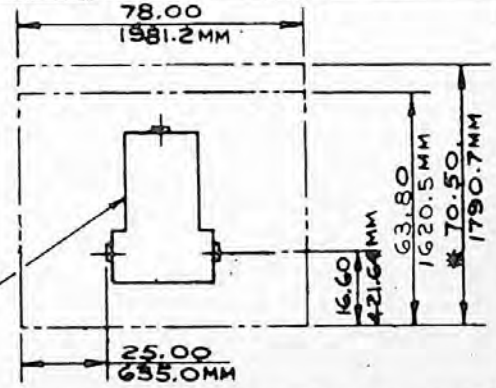
MOTOR SPEEDS

SPIN. TYPE			
ORI-FLEX	SPINDLE	1 H.P.	3600 R.P.M.
DIR. DR. 1	SPINDLE	1½ H.P.	3600 R.P.M.
DIR. DR. 2	SPINDLE	2 H.P.	3600 R.P.M.
DIR. DR. 3	SPINDLE	2 H.P.	1800 R.P.M.
TYP.	HYDRAULIC PUMP MOTOR	1 H.P.	1800 R.P.M.
TYP.	* COOLANT PUMP MOTOR	1/8 H.P.	3600 R.P.M.

DUST COLLECTOR EQUIPMENT CONNECTION INLET.

WHEEL SIZE	INLET SIZE
7 IN.	3.00-76.2 MM
8 IN.	3.00-76.2 MM
12 IN.	4.00-101.6 MM





*DENOTES WITH WET GRINDING EQUIPMENT.

ENGINEERING DATA

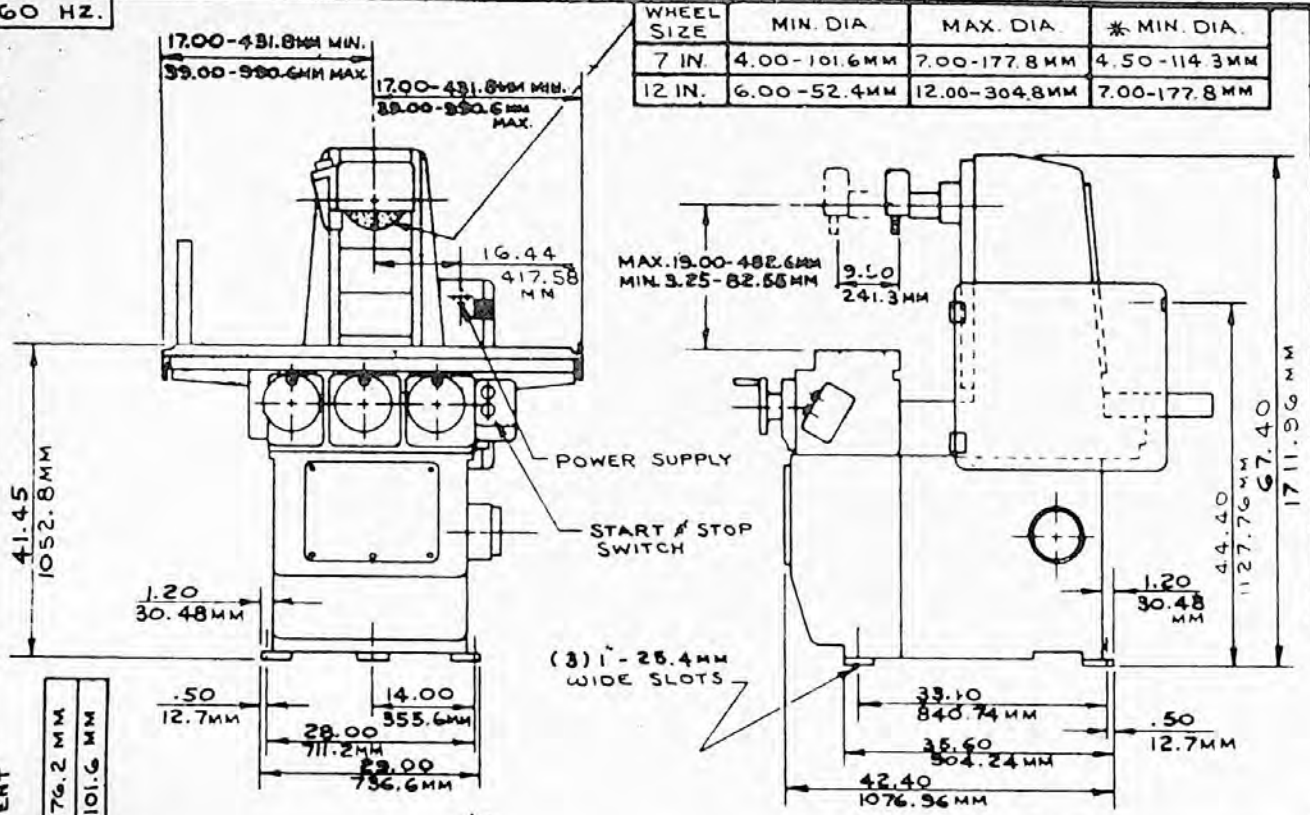
FLOOR PLAN

FLOOR PLAN	H.P. REQ'D.		WT. LBS.		DR. BY H.N.C.	DATE 6-18-73	CH'K'D BY	REV. B

DATA SHEET AND FLOOR PLAN	BROWN & SHARPE MFG. CO. NORTH KINGSTOWN, R. I., U. S. A.	TYPE OF MACHINE: NO. 818 POWER FEED & HAND FEED SURFACE GRINDING MACHINE.	MACHINE SERIAL NO.: 523-818-	USER'S MACHINE NO.	DRAWING NO.: 23-99990-43

60 HZ.

WHEEL SIZE	MIN. DIA.	MAX. DIA.	* MIN. DIA.
7 IN.	4.00-101.6MM	7.00-177.8MM	4.50-114.3MM
12 IN.	6.00-52.4MM	12.00-304.8MM	7.00-177.8MM



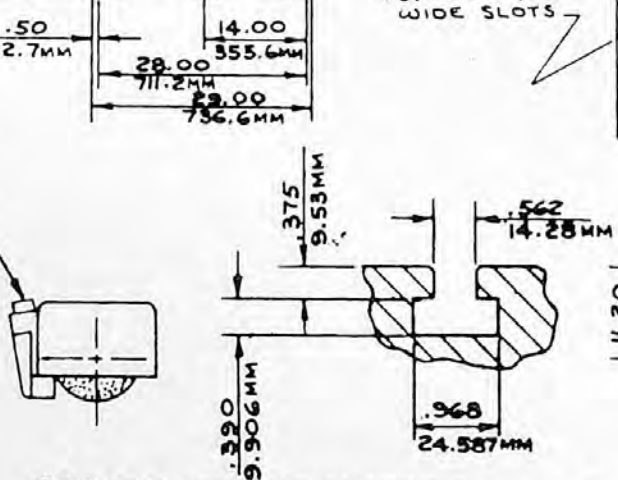
WHEEL SPEEDS				
SPIN. TYPE	SIZE	R.P.M.	FEET PER MIN.	METERS PER MIN.
DIR. DR. 1	7 INCH 177.8 MM } DIA.	3600	6597	2011
DIR. DR 2	12 INCH 304.8MM } DIA.	1800	5655	1724

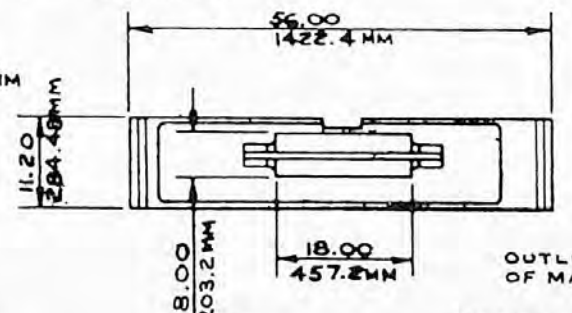
TYPICAL	
	TABLE FEEDS (POWER FEED MACH. ONLY)
	5 FT. 1.52 M } PER MIN. TO INFINITELY VARIABLE 100 FT. 30.47M } PER MIN.
	VERTICAL HAND FEED OF WHEEL
	.0001 INCH .0025 MM } STEPS
	CROSS FEEDS (POWER FEED MACH. ONLY)
	INFINITELY VARIABLE .010 INCH .254 MM } TO .250 INCH 6.35 MM }

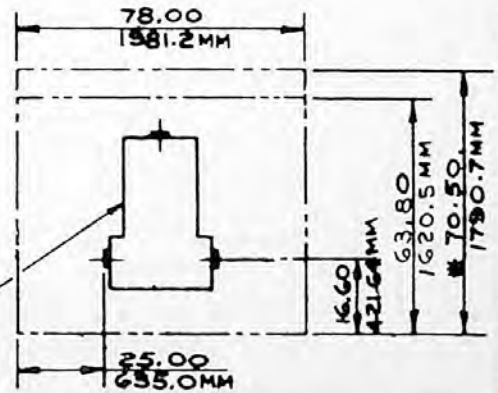
SPIN. TYPE	MOTOR SPEEDS		
DIR. DR. 1	SPINDLE	2 H.P.	3600 R.P.M.
DIR. DR. 2	SPINDLE	2 H.P.	1800 R.P.M.
TYP.	HYDRAULIC PUMP MOTOR	1 H.P.	1800 R.P.M.
TYP.	* COOLANT PUMP MOTOR	1/8 H.P.	3600 R.P.M.

DUST COLLECTOR EQUIPMENT CONNECTION INLET.

WHEEL SIZE	INLET SIZE
7 IN.	3.00-76.2 MM
12 IN.	4.00-101.6 MM







OUTLINE OF MACHINE.

* DENOTES WITH WET GRINDING EQUIPMENT.

ENGINEERING DATA

FLOOR PLAN

FLOOR PLAN	H.P. REQ'D.		WT. LBS.		DR. BY H.N.C.	DATE 6-18-73	CH'K'D BY	REV. B

BROWNE SHARPE 6"X18"
MICROMASTER
SURFACE GRINDER

(WHEN SPEC.)
MAGNETIC CHUCK
NEUTROFIER
L1 L2

MTR.1
SPINDLE MOTOR
Δ HP
Δ AS SPECIFIED
T1 T2 T3
1OL

MTR.2
HYDRAULIC PUMP MOTOR
1 HP (WHEN SPEC.)
T11 T12 T13
2OL

MTR.3
COOLANT PUMP MOTOR
1/8HP (WHEN SPEC.)
T21 T22 T23
3OL

ECT SWITCH
1FU L1
2FU L2
3FU L3
M L11 L12 L13
1T
7 8
.5A 4FU
MACHINE STOP 1PB
MACHINE START 2PB
M 2 3
1
2
3
4
5
2OL 3OL 1OL
3 4 5 6 M 8
MAIN STARTER L1, L2, L3, 2
JUMPER "A" REFER TO NOTE "A"
JUMPER "B" REFER TO NOTE "B"
3
SPRAYMIST SOL. (WHEN SPEC.)
1SS (WHEN SPEC.) POWER DOWNFEED OFF ON
3 10
10 8
POWER DOWNFEED SOL. (WHEN SPEC.)