

**OPERATION
AND
MAINTENANCE**

OF THE

824, 1024, 1030, 1224 AND 1236

MICROMASTER

SURFACE GRINDING MACHINES

Brown & Sharpe

PRICE \$3.50

OPERATION AND MAINTENANCE

of the

824, 1024, 1030, 1224 AND 1236 MICROMASTER SURFACE GRINDING MACHINES



BROWN & SHARPE MFG. CO.

PRECISION PARK, NORTH KINGSTOWN, R. I., U. S. A. 02852

FOREWORD

The purpose of this book is to give a thorough working knowledge of the Brown & Sharpe MICROMASTER 824, 1024, 1030, 1224 and 1236 Surface Grinding Machines.

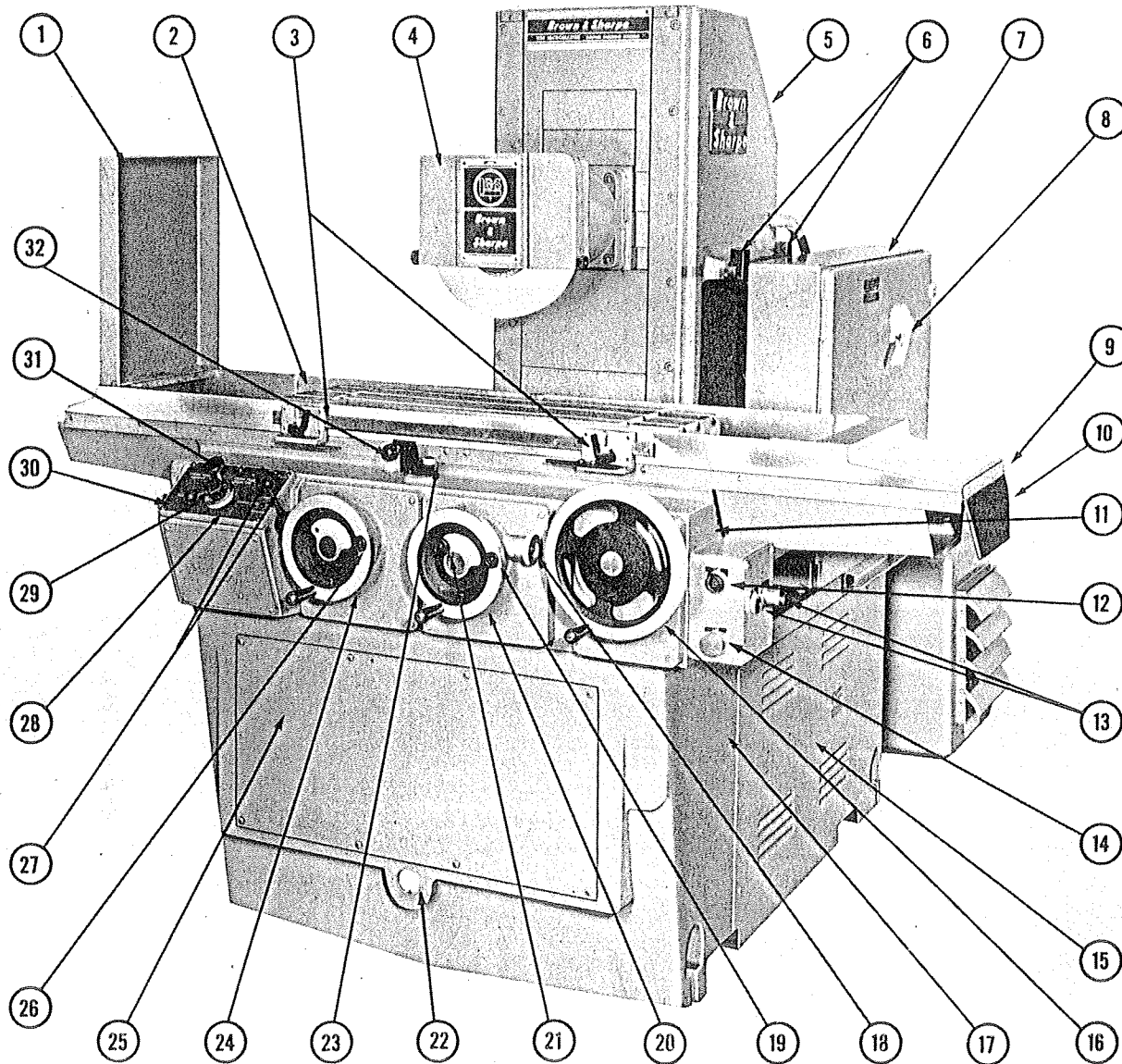
The Operator and Set-up Man will need to be thoroughly familiar with the information given in Chapter II. It includes a detailed explanation of each set-up adjustment and operating control, instructions on mounting and truing grinding wheels and suggestions on set-up and operation. Many additional suggestions are given in the next chapter which illustrates and describes typical operations.

The Maintenance Man will be particularly interested in Chapters I, IV and V. Chapter I covers the installation or relocation of the machine; Chapter IV covers maintenance and Chapter V is devoted to the hydraulic system. Familiarity with the facts presented in Chapter II will also prove of value to the maintenance man.

As Brown & Sharpe is constantly improving the design of its machines, there may be some instances where this book differs somewhat from the machine that you are concerned with.

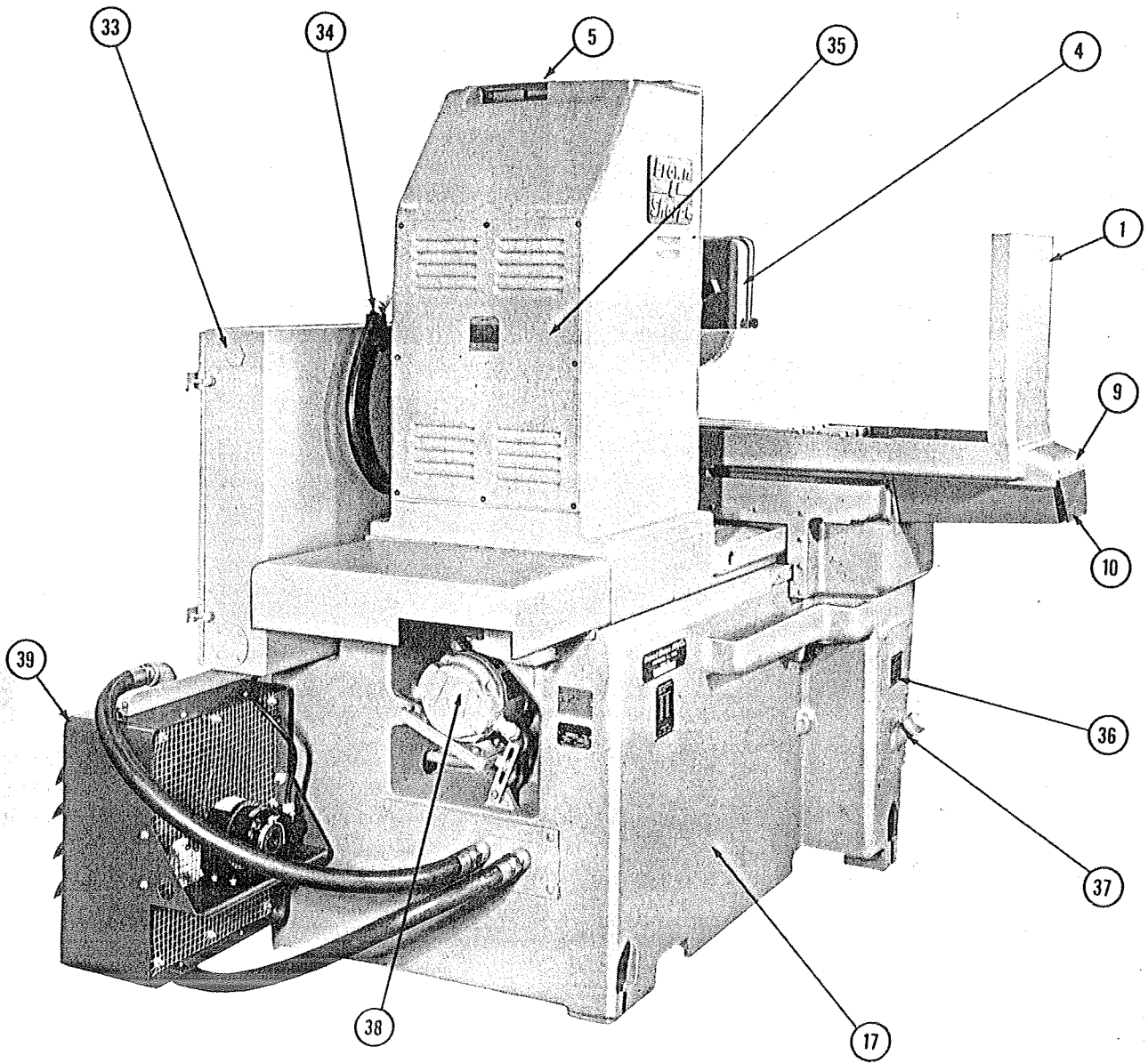
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OPERATING CONTROLS AND PRINCIPAL PARTS

- | | | | |
|----|-----------------------------|----|--|
| 1 | Dust deflector | 13 | Rapid vertical power positioning pushbuttons |
| 2 | Table | 14 | Stop button |
| 3 | Table Dogs | 15 | Access panel to compartment containing hydraulic pump and filter |
| 4 | Wheel guard | 16 | Table handwheel |
| 5 | Upright | 17 | Base |
| 6 | Cross feed trip dogs | 18 | Fine feed knob, elevating handwheel |
| 7 | Electrical controls cabinet | 19 | Dial locknut, elevating handwheel |
| 8 | Main disconnect switch | 20 | Elevating handwheel |
| 9 | End guard strap | 21 | Fine feed locknut, elevating handwheel |
| 10 | End guard | | |
| 11 | Bed | | |
| 12 | Start button | | |



- | | | | |
|----|--|----|--|
| 22 | Sight gage for hydraulic reservoir | 31 | Cross feed amount knob |
| 23 | Reversing lever contact roller | 32 | Table reversing lever |
| 24 | Cross feed handwheel | 33 | Power cable entrance |
| 25 | Front access panel, hydraulic compartment | 34 | Spindle drive motor cable |
| 26 | Dial locknut, cross feed handwheel | 35 | Access panel, spindle drive motor compartment |
| 27 | Cross feed selector knob and direction lever | 36 | Side access plate, hydraulic compartment |
| 28 | Throttle adjustment bushing | 37 | Filler spout for hydraulic reservoir |
| 29 | Table throttle lever | 38 | Motor for rapid vertical power positioning |
| 30 | Bushing set screw | 39 | Heat exchanger for cooling oil in hydraulic system |

CHAPTER I

Installing or Relocating the Machine

Handling and Leveling. This machine can be lifted with a fork truck (Fig. 1). There are slots cast into the underside of the machine into which the forks can be inserted for this purpose. However, when using a fork truck to lift this machine, the table bed guard at one end of the machine will have to be removed and the table

during shipment, must be removed before the machine is used. However, we recommend that these braces be installed on the machine whenever it is moved.

The machine should be located on a level foundation or floor, a solid vibrationless foundation being essential where the finest finish must be produced. If the machine

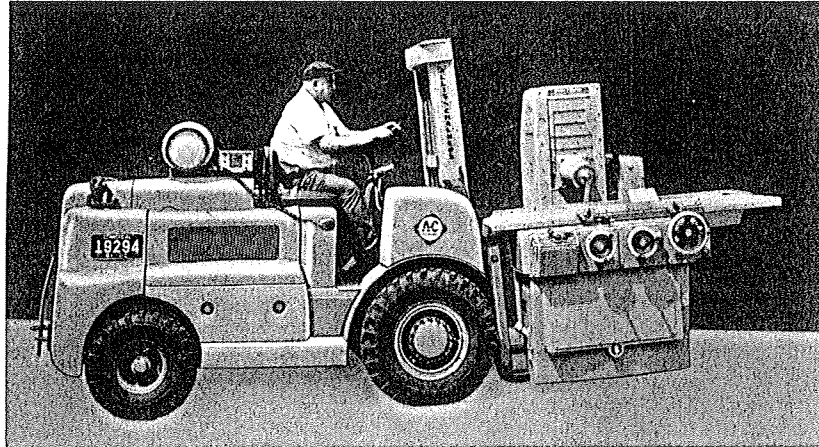


Fig. 1. Proper method of lifting machine.

moved to the opposite side of the machine. The fork will then be inserted from this side of the machine.

The machines are shipped with shipping clamps in front of the upright and inside the column. These clamps, which hold the upright in position as a safety measure

must be set on a wooden floor, locate it over a beam and on a portion of the floor which is free of vibration. In case the foundation or floor unavoidably transmits vibration to the machine, set the machine on isolation mounts. With the table in position, test the surface of the table

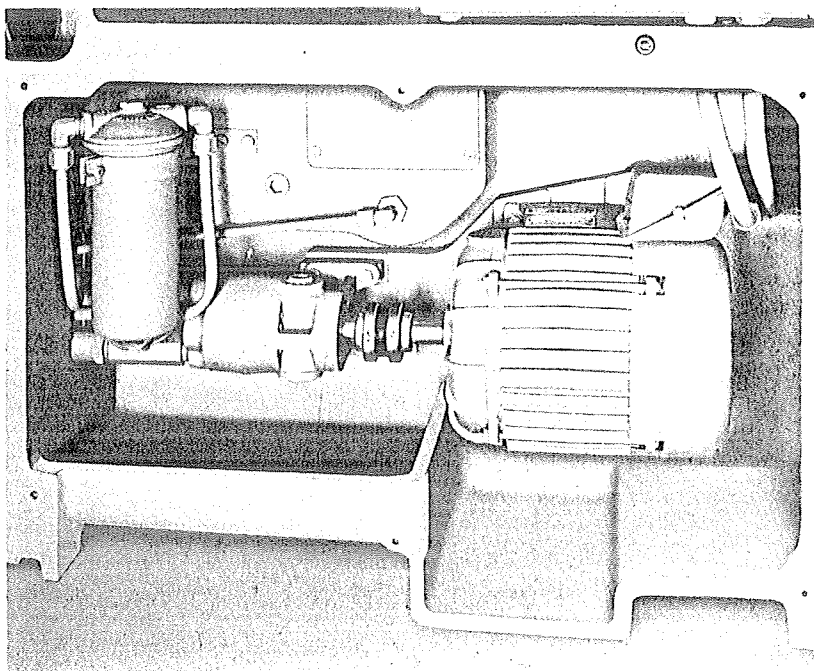


Fig. 2. Interior of compartment in right side of base.

both longitudinally and transversely with a precision spirit level and drive a wooden shingle under any corner or corners of the machine that may be low. Make sure that all four corners are supported; then tighten the lag screws, test the level of the table surface again in both directions and readjust if necessary.

Lubricating a New Machine. Before attempting to operate a new machine or one that has been idle for some time, it is essential to fill the oil reservoir for the lubricating and hydraulic systems.

The Hydraulic System and Lubricating System of these machines use a common oil reservoir. This reservoir should be filled through the filler spout at the left side of the base (Fig. 3) until the level reaches the FULL mark on the sight gage at the lower front center of the base. Capacity of the reservoir is approximately 23 gallons. The oil used should be a good grade, high lubricity, way and hydraulic oil having a viscosity of 150 S.S.U. at 100°F. Recommended oils include Socony Mobile Oil Company, Vacuoline No. 1405; Sun Oil Company, Sun Lubeway No. 1706; and Standard Oil Company of Indiana, Stanway No. 15H.

When first starting a new machine, or after changing the oil, run the pump for about an hour with the table speed control in the OFF position. This will allow any contamination in the oil to be filtered out and settled at the bottom of the reservoir.

Electrical Controls

Connecting to Power Supply. The machine should be connected to the power line and properly grounded. The lines from the power source should be connected to

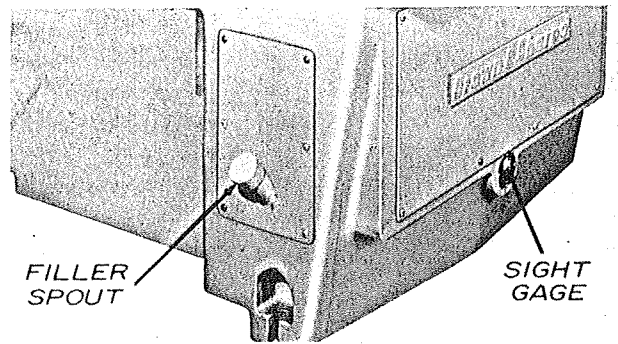


Fig. 3. Filler spout and sight gage for oil reservoir.

the electrical control panel through a hole at the back of the machine provided for this purpose.

Checking Motor Rotation. Before running a newly-connected machine, check the direction of motor rotation as follows:

Press the START button, *immediately* press the STOP button and 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 conveniently done by transposing two of the wires at the line disconnect switch.) Do not change the internal wiring of the machine. To avoid serious damage to the spindle, do not under any circumstances allow the machine to run with the spindle turning in the wrong direction. If the spindle rotation was counterclockwise during the test, check the belt on the lubricating oil pump to be sure that it is in place before operating the machine. Rotation in the wrong direction may cause the belt to jump off its pulley.

CHAPTER II

Set-up Adjustments and Operating Controls

This chapter explains the purpose and use of each of the controls and adjustments used in setting up and operating the MICROMASTER Surface Grinding Machines.

Starting the Machine. The push-buttons located on the right front of the machine (Fig. 4) start and stop the motors for the spindle drive and the hydraulic and lubricating pump. The antifriction-bearing spindle can be

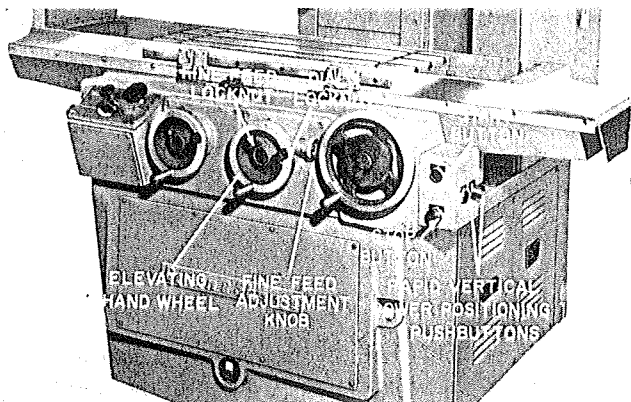


Fig. 4. Pushbutton controls and elevating handwheel.

started immediately at any time without taking steps to provide lubrication, as it is permanently lubricated at the factory.

Vertical Adjustment. The elevating handwheel is on the front of the machine at the center (Fig. 4). The handwheel has an adjustable dial graduated to read to 0.000,2". A fine feed knob mounted adjacent to the handwheel is graduated to indicate vertical adjustment to 0.000,1".

One revolution of the handwheel moves the grinding wheel 0.050". The vertical adjustment is 14³/₄" on the 824, 1024 and 1030 machines, and 19¹/₄" on the 1224 and 1236 machines. The maximum height of work ground with a 12" diameter wheel is 14¹/₂" on the 824, 1024 and 1030 machines, and 19" on the 1224 and 1236 machines.

Rapid vertical power positioning pushbuttons at the right side of the machine (Fig. 4) raise or lower the wheel at 40 inches per minute.

See Chapter VI for Extra Vertical Capacity Parts where increased vertical capacity is desired.

Wheel Spindle

Drive. With the exception of the 1224 and 1236*, machines are furnished with either Oriflex drive (through

six "O" rings from a 3 H.P. motor) or direct drive (from a 5 H.P. motor) to the wheel spindle.

*The 1224 and 1236 machines are available with direct drive spindle only.

Wheel Speed. When the spindle is driven by a 60 cycle direct drive motor, the speed is 1800 R.P.M.; with the spindle using the Oriflex drive, the speed is 1920 R.P.M.

Wheel Guard. The wheel guard is a two-piece unit with a removable cover (Fig. 5), which is held in place

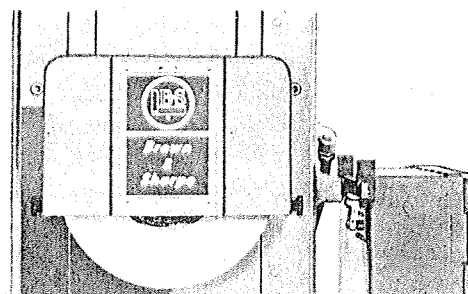


Fig. 5. Wheel guard.

by a knurled-head screw on each side. To remove the cover, simply loosen the screws and lift up the cover.

Two clamp screws located behind the wheel guard can be loosened and the guard tipped either side of horizontal if necessary.

Always make sure that the guard is securely clamped before starting the machine. Never run a wheel without having the guard and its cover in place.

Care and Use of Grinding Wheels

Selecting the Wheel. In order to produce the desired quality of work in the shortest time, real care is necessary in choosing the wheel which is best for the job at hand. Literature which will help in making this choice is readily available from the major wheel manufacturers.

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. Thus, 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 cannot 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 a trifle tight 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 lightly tap the edge of the wheel and 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 a part of the wheel sleeve (see Fig. 6).

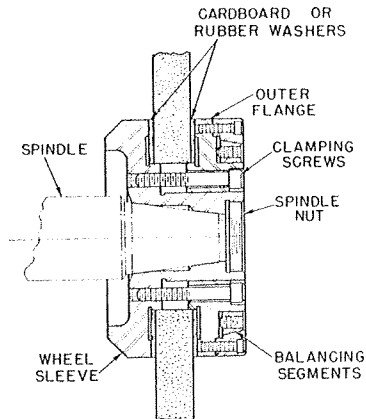


Fig. 6. Proper mounting of grinding wheel.

The outer flange is fastened to the wheel sleeve by means of four socket head cap screws and includes two weights for balancing. 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.

Tighten the clamping screws enough to hold the wheel firmly in place on the sleeve. Do not tighten too much, however, as excessive clamping pressure will crack the wheel.

Balancing the Grinding Wheel. It is essential that the wheel run perfectly true and without vibration. Two balancing segments are provided on the wheel sleeve and are adjusted as follows to balance the wheel:

1. With the wheel mounted on the wheel sleeve, set and clamp the two balancing segments 180° apart. Then place the wheel and sleeve on the machine and true the wheel.

2. Remove the wheel and sleeve from the machine and using a suitable balancing arbor and ways, let the wheel come to rest and mark the low point to locate the heavy side.

3. Loosen the segment locking screws and slide the segments around to a trial position, locating both segments above the horizontal and at the same distance each side of the mark on the heavy side. Then clamp the segments and let the wheel come to rest.

4. Repeat the adjustment as necessary until the wheel is in balance, remembering at all times to keep the segments located the same distance each side of the mark on the heavy side. If the wheel comes to rest with the mark at the bottom, move the segments farther up; and if it comes to rest with the segments at the bottom, move the segments in the other direction.

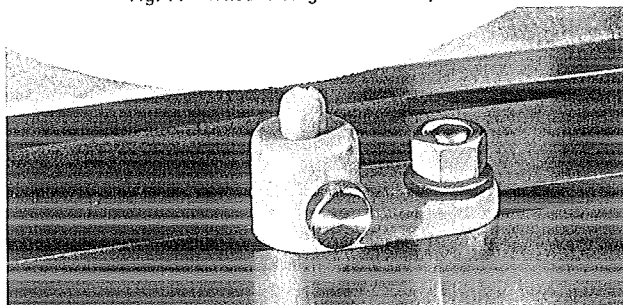
The wheel is in balance when it will remain at rest in all positions on the balancing ways.

Changing Wheels. In removing a wheel sleeve from the spindle, always use the *wheel sleeve puller* (furnished with the machine) to avoid any chance 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 wheel sleeve puller into the wheel sleeve and tighten 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.

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. 7. 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. 7. Wheel truing fixture ready for use.



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 described on page 28.

In truing a wheel for rough grinding, take a cut about 0.000,5" deep in one pass of the diamond across the wheel and finish with a similar cut 0.000,25" deep. If the wheel is to be used for finish grinding, take two 0.000,5" cuts; then take two or three additional cuts removing about 0.000,25" each time, and finally pass the diamond across the wheel once or twice without further advance of the wheel. The figures stated are approximate and under some conditions should be varied somewhat to give desired results.

The wheel can be trued to a radius or angle and combinations of radial and angular shapes can be obtained by using the Radius and Angle Wheel Truing Attachment described on page 28.

Accurate radii, both concave and convex, with accurate tangents at either or both sides of the radii can be formed with the Continuous Radius and Tangent Wheel Truing Attachment described on page 28.

The time required for wheel truing can be greatly reduced by use of the Over-The-Wheel Truing Attachment or the Power Truing Arrangement described on page 27. With these attachments the workpiece remains undisturbed beneath the wheel and the diamond is always ready for immediate use.

Longitudinal Table Travel

Table Dogs. It is advisable to check the table dogs (Fig. 8) before running the power table travel to prevent any mishap. The dogs can be set to limit table travel in either direction.

Use the handwheel to bring the work to the desired points of reversal. Move the table to the left and locate the desired point of reversal. Next, move the right quick-setting table dog so that it contacts the right contact roller on the reversing lever. Locate the position of the left table dog in the same way, moving the table to the right to locate the desired point of reversal. Next, move the left table dog so that it contacts the left contact roller on the reversing lever.

Power Travel. To engage power table travel, turn the table throttle lever (Fig. 8) clockwise until the desired

Fig. 8. Controls and adjustments at front of machine.

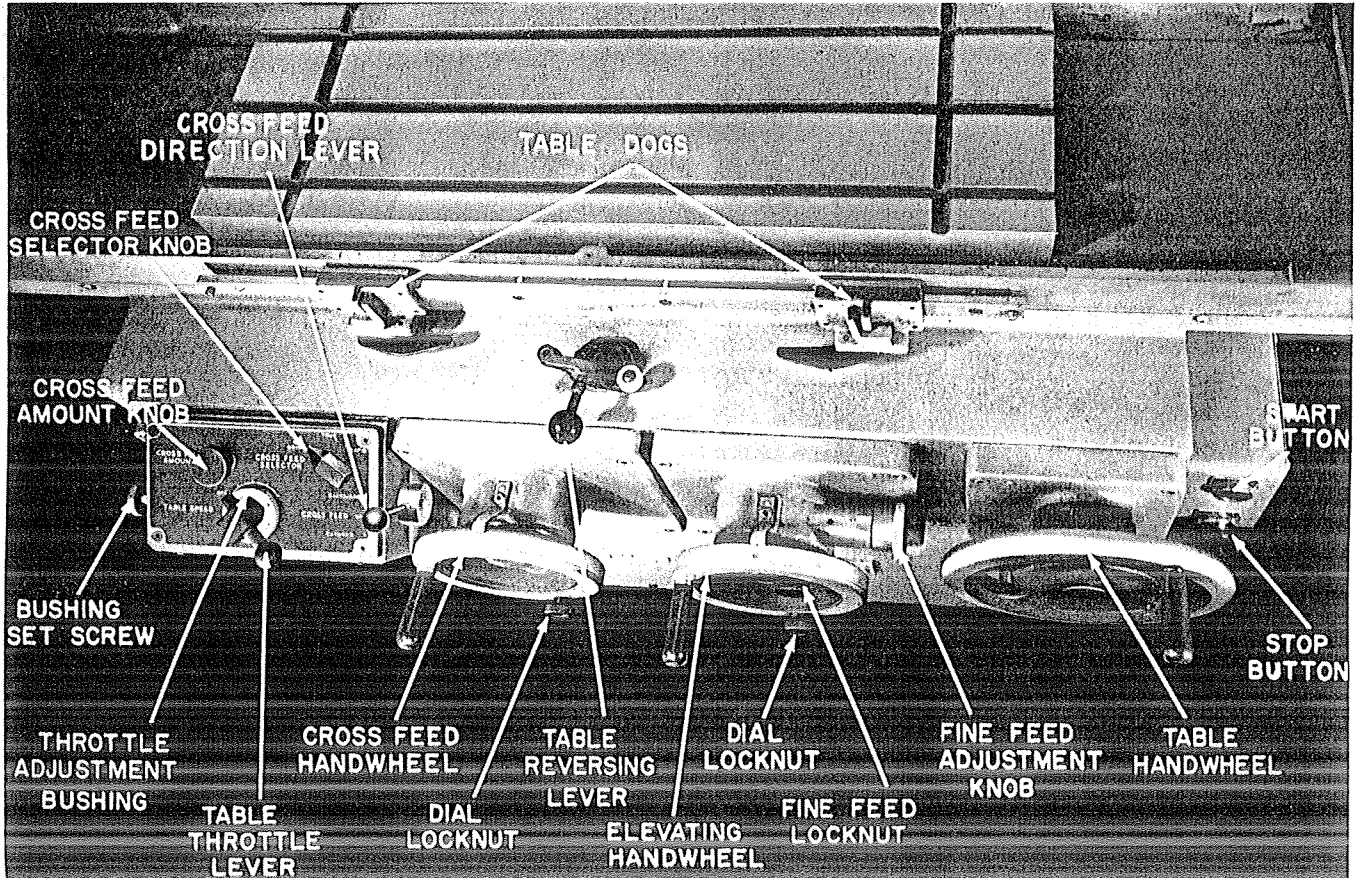


table speed is attained. Loosen the bushing clamp screw and turn the throttle adjustment bushing until the pin rests against the lever; then tighten the clamp screw. The machine is now set at a table speed which will not require resetting if the machine is stopped.

The table throttle lever not only adjusts the power table speed, it also provides a convenient means of starting and stopping the table travel.

Power table travel is obtained through a hydraulic piston at a speed of from 10 to 125 feet per minute (10 to 90 FPM on the 1236 machine).

The handwheel automatically disengages when using power table travel.

Maximum longitudinal table travel is 28" on the 824, 1024 and 1224 machines; 35" on the 1030 machine; 41" on the 1236 machine.

Table Reversal. For power operation, table reversal is controlled either manually or automatically. The reverse lever is shown in Fig. 8.

In setting the table dogs for automatic reversal, be sure to allow enough over-travel. The work must go beyond the grinding wheel in both directions to assure the completion of cross feeding before the work comes back under the wheel.

Hand Table Travel. The table handwheel, used for making longitudinal adjustments, is located on the right front of the machine (Fig. 8). One turn of the handwheel moves the table $1\frac{1}{2}$ ".

Cross Feed

Power Cross Feed. The cross feed handwheel is located on the left front of the machine (Fig. 8). It has an adjustable dial graduated to read to 0.000.2". A fine feed knob mounted adjacent to the handwheel and graduated to indicate transverse adjustment to 0.000.1" is available (at extra cost).

Any cross feed from 0.010" to 0.500" can be obtained at each reversal of the power longitudinal table travel. The maximum travel is 10" on the 824 machine, 12" on the 1024 and 1030 machines and 14" on the 1224 and 1236 machines. A continuous hydraulic cross feed of 10 inches per minute is provided for wheel truing and a fast positioning of the wheel at 150 inches per minute.

In setting up the cross feed, the cross feed trip dogs, which are of the quick-setting type, should first be positioned to stop travel at the desired points. These dogs are shown in Fig. 9.

The increment of cross feed is set by a knurled knob at the upper left of the table speed lever. Circular lines on the shaft beneath the knob indicate the setting.

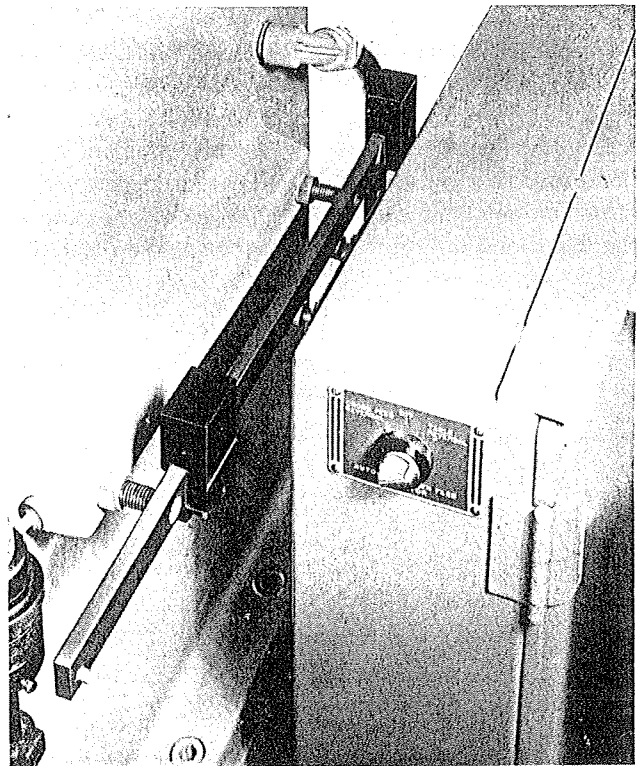


Fig. 9. Cross feed trip dogs.

Cross feed direction is controlled by a lever at the right side of the control case. This lever starts and stops the power cross feed movement and controls the direction. A knob mounted on the panel above and to the right of the table speed lever selects the type of cross feed: GRIND, TRUE or RAPID.

Suggestions on Set-Up and Operation

Clamping Work to Table. In clamping workpieces, chucks, vises, etc. to the table of the machine, use only enough clamping pressure to hold the part from slipping. Tight clamping is not necessary, since the forces exerted on the work are quite small. Excessive clamping might spring the table enough to cause inaccuracies in the work.

Rough and Finish Grinding. In general, it is not advisable to use one machine consistently for heavy hogging cuts and for highest-quality finish grinding as well. If large amounts of heavy roughing work are to be done, it is best to use one machine for that class of work and do the finish grinding on a machine reserved for finish grinding only.

Spindle Alignment. The contacting surfaces of the spindle head and spindle sleeve flange are ground at our

factory to give a good commercial accuracy of alignment of the spindle with relation to the table ways. For shoulder grinding jobs which demand greater-than-ordinary closeness of parallelism between the side of the wheel and the table travel, the required alignment can be secured by carefully scraping the spindle sleeve flange. Note that any alteration by scraping should be done on the flange and not on the face of the spindle head. The

spindle head should remain untouched so as to permit other spindles to be used in the machine.

Dry Grinding. In dry grinding operations, use an exhaust attachment to protect the operator, the machine itself and neighboring machines from the grit and dust produced. Either connect the machine to a central exhaust system or use an exhaust attachment such as the one described on page 24.

CHAPTER III

Typical Operations

The operations shown in this chapter are representative of the various types of work performed on these machines. While no attempt has been made to describe each job in detail, the main features of set-up and oper-

ation are outlined as a guide to good grinding practice.

Operations shown utilize available additional equipment as well as equipment furnished with the machine. All operations can be performed with ease and efficiency.

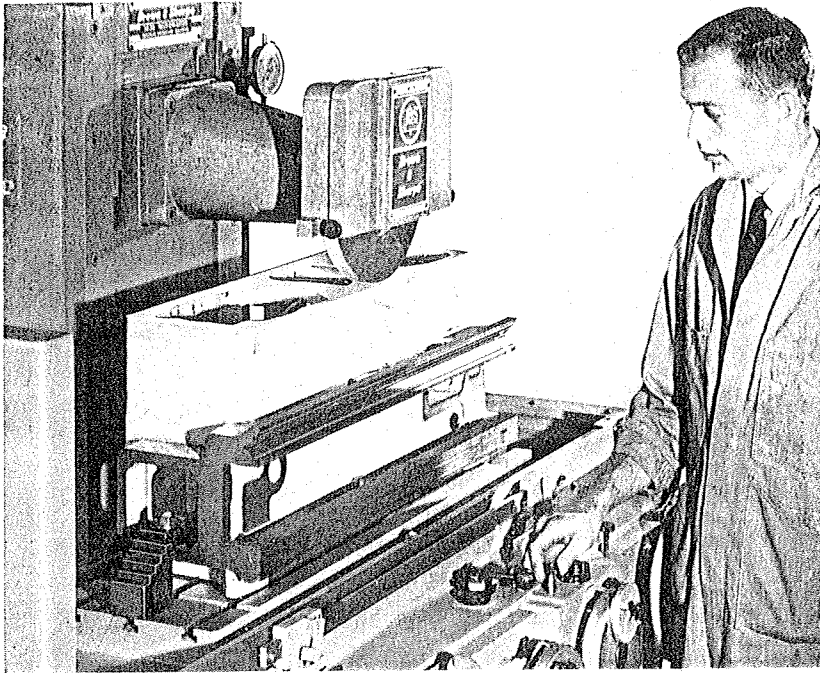
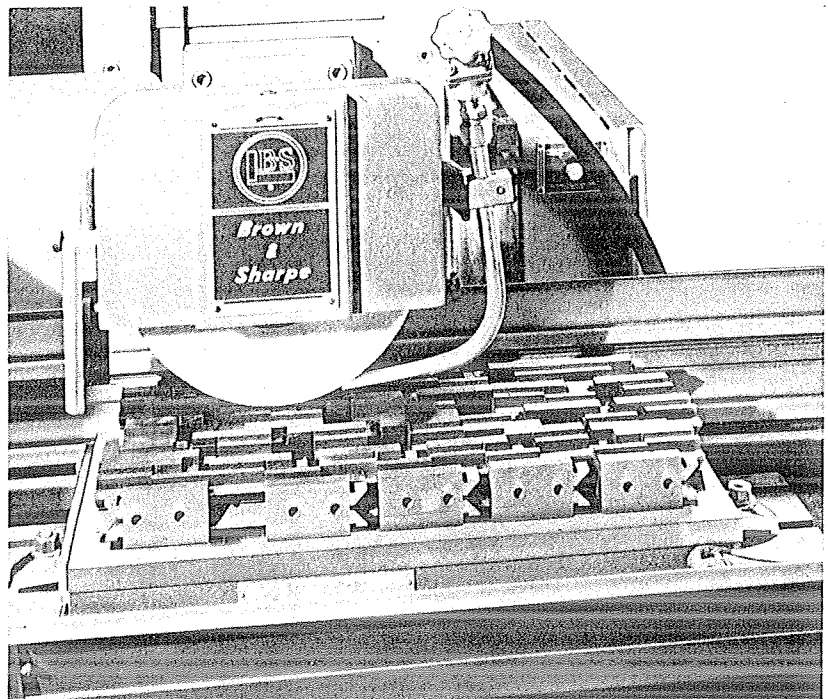


Fig. 10. This machine, equipped for automatic surface grinding to a positive stop, gives greatly increased production rates while reducing operator fatigue to a minimum. Once the machine is set up, opportunities for operator error are virtually eliminated. Note the large vertical capacity of the machine.

Fig. 11. A production setup which takes advantage of the uniform distribution of magnetic force in the chuck to hold a large number of small workpieces.



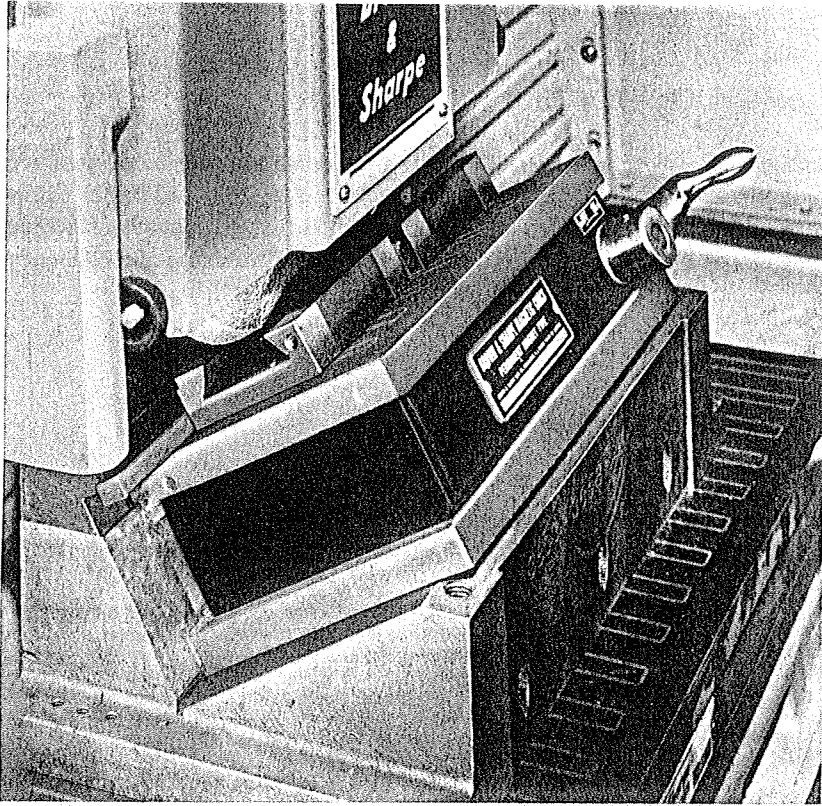


Fig. 12. Accurate slot and sidewheel grinding operations are readily performed on these machines. The Radius and Angle Wheel Truing Attachment enables the operator to form the wheel to the required angle with ease and precision.

Fig. 13. A surface grinding operation being performed on two pump housing castings. Hard-to-clamp workpieces such as these are quickly loaded and unloaded when using the Permanent Magnet Chuck.

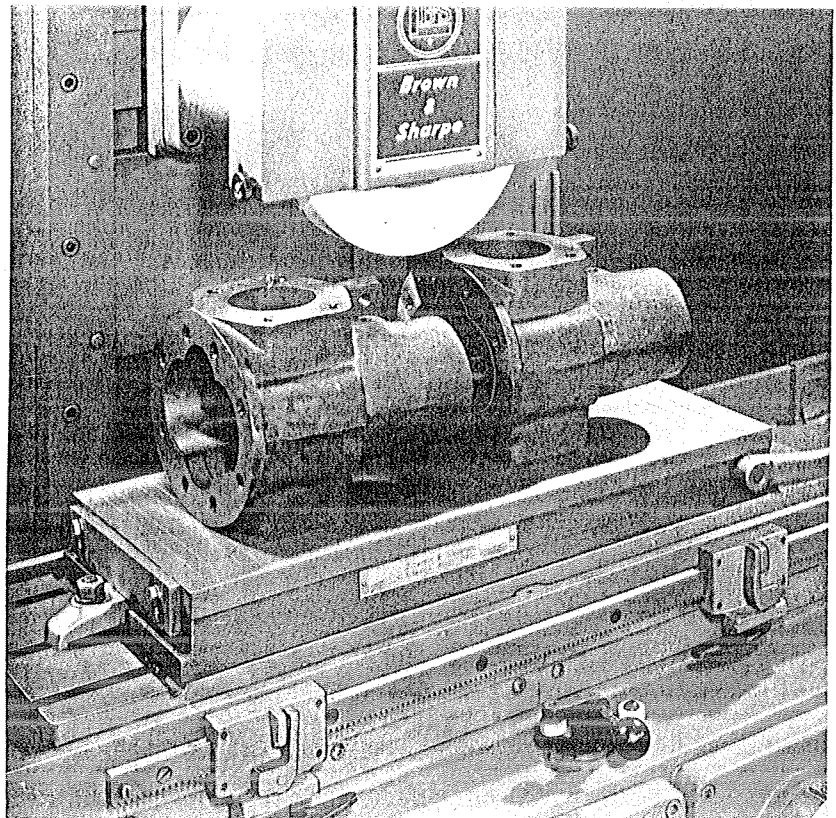


Fig. 14. A sidewheel grinding setup. The mounting of the table in generous V and flat ways on the fixed bed permits such jobs to be done with exceptional accuracy.

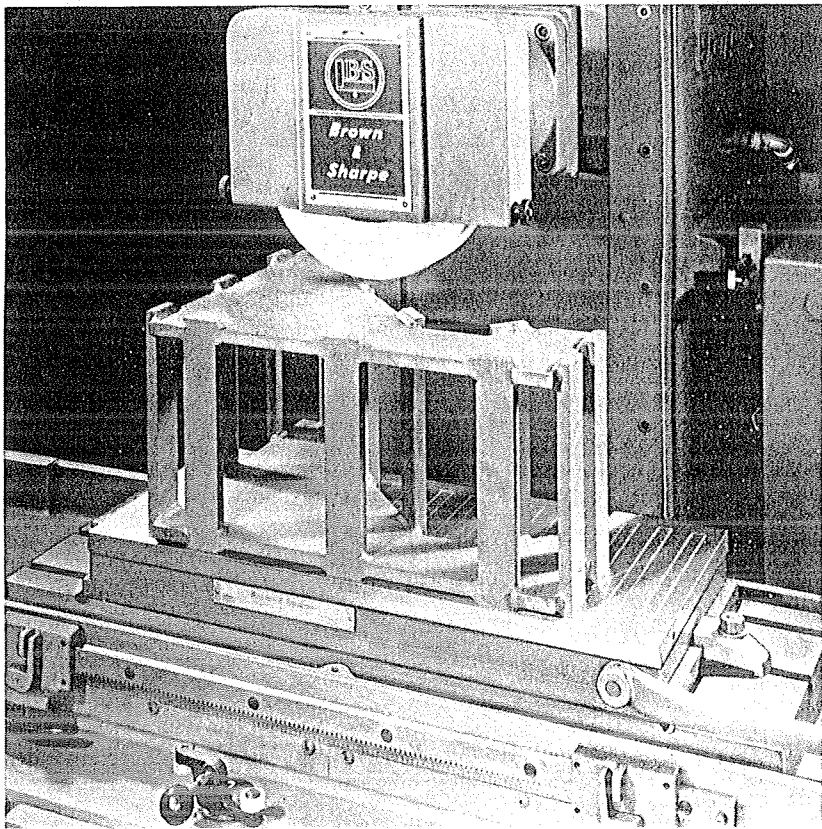
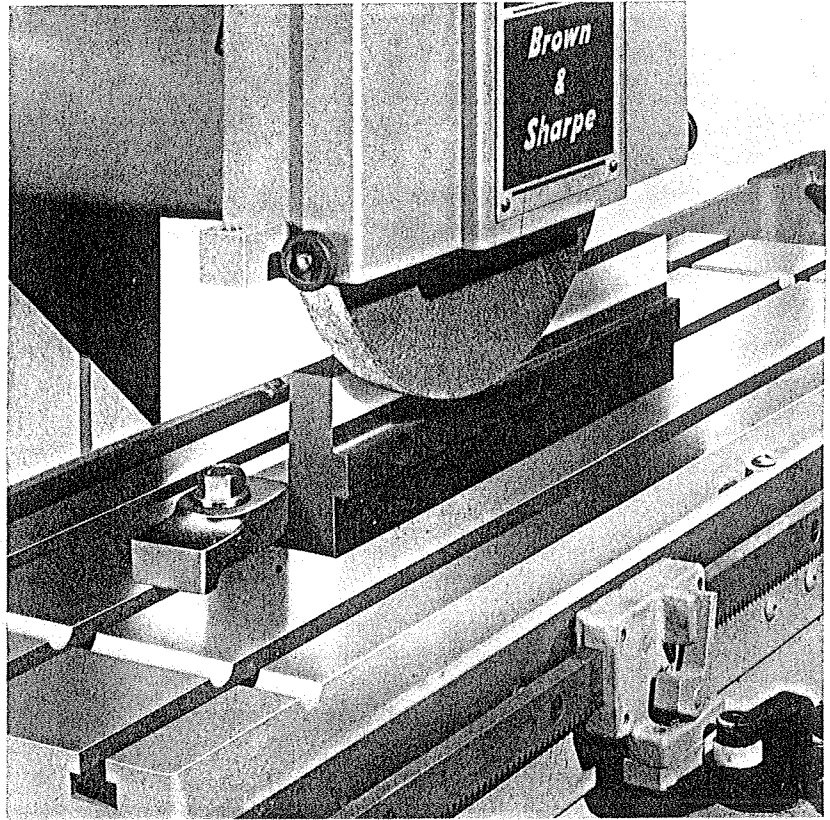


Fig. 15. The Permanent Magnet Chuck facilitates turning the workpiece when surfaces on more than one side are to be ground.

CHAPTER IV

Maintenance**Lubrication**

Oil for lubricating the machine is supplied by the low pressure side of the hydraulic system (see Chapter V, page 19).

Wheel Spindle

Wheel Spindle. The machines are equipped with super-precision antifriction bearing units with a choice (except the 1224 and 1236 which are available with direct drive only) of either Oriflex Drive (through six "O" rings from a 3 H.P. motor) or Direct Drive (from a 5 H.P. motor). They are removable unit-type construction and are interchangeable. The wheel sleeve furnished takes wheels from 1" to 1½" thick.

A grinding machine spindle may be properly classified as a high-precision tool. The accuracy of construction required will be realized from the fact that a variation of one hundred-thousandth of an inch (0.000,01") in a ground flat surface will be visible to the naked eye as a wheel mark. Consequently, the best results can be obtained only if the spindle is treated with the consideration due to any fine precision instrument. *Hammering on the ends of the spindle, dropping it on the floor or work bench, or any other undue application of force or impact must be carefully avoided* if the spindle is to be kept in proper running condition.

If eventually a spindle should need repair or adjustment, we recommend that it be returned to our factory for reconditioning. By installing an extra spindle unit, kept on hand for such contingencies, production can continue with little interruption. It is a quick and simple matter to change spindles on these machines.

Removing Spindle Unit From Machine

Lift off the wheel guard cover, remove the wheel and then the wheel guard. Remove the cover at the rear of the upright (Fig. 16).

If equipped with Oriflex drive, remove the two screws on the bottom front of the spindle head (Fig. 17) and slide the guard down. Remove the six "O" rings from the pulley, take out the four clamping screws in the spindle unit flange and draw out the spindle unit from the front of the machine.

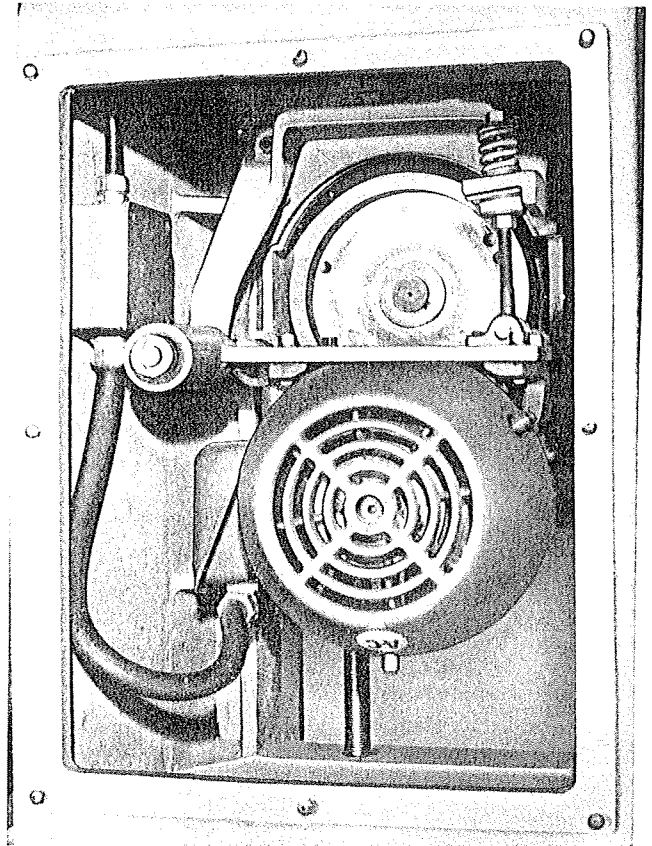


Fig. 16. Rear view of upright compartment, showing motor and Oriflex drive.

If equipped with direct drive, loosen the set screw in the spindle head (Fig. 18) and remove the spindle and motor as a unit from the rear of the machine. Be sure that the motor cable is disconnected.

Lubrication. The spindle is mounted on super-precision, preloaded ball bearings at both front and rear. Grease lubrication is used and the spindle's cool running temperature is quickly reached. The unit is sealed and requires no additional lubrication after it leaves our factory. As dirt cannot enter past the seals, this spindle has a long, trouble-free life.

Maintenance. Because of the extreme care required in disassembling and reassembling this spindle, we

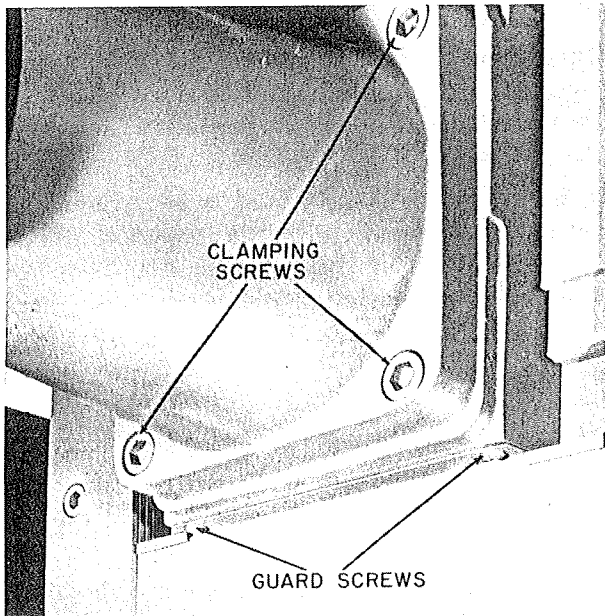


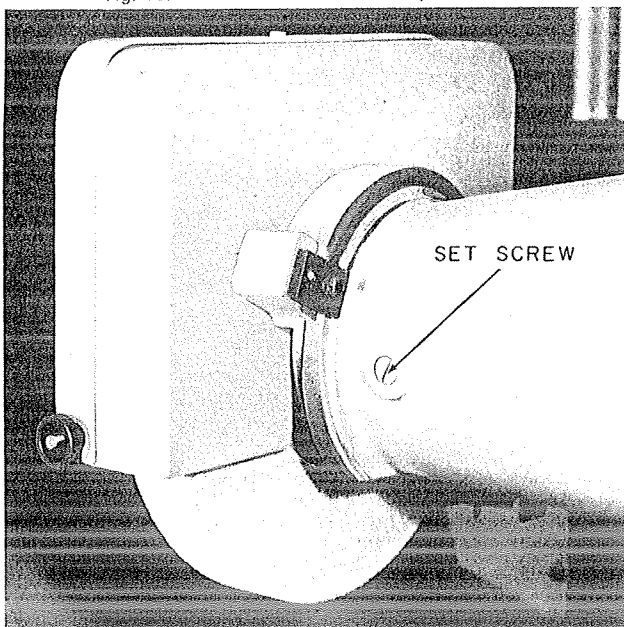
Fig. 17. Mounting of spindle unit flange.

strongly recommend that any unit which needs repair be returned to our factory for reconditioning.

Replacing Spindle Unit in Machine

If spindle unit with Oriflex drive is used, insert the spindle unit in the spindle head at the front of the machine. Replace the four clamping screws and tighten to clamp the spindle unit flange securely to the spindle face. Install the six "O" rings in their corresponding grooves on both pulleys. Adjust the position of the motor bracket (Fig. 16) so that the motor pulley clears the

Fig. 18. Set screw in direct drive spindle head.



spindle head by approximately $\frac{1}{4}$ ". Replace the cover at the rear of the upright and fasten the guard to the bottom front of the spindle head with the two screws provided.

If a direct drive spindle is used, insert the spindle and motor from the rear of the machine upright. Position the unit and tighten the set screw in the spindle head. Do not under any circumstances remove the flange. This flange aligns the spindle and is set at the factory. Connect the motor cable and replace the panel at the rear of the upright.

Adjustment Mechanisms

The vertical, longitudinal and cross feed handwheel mechanisms are self-contained units. Each is held to the front of the machine by four bolts and can be taken off easily by removing these bolts.

Cross Feed Mechanism. To remove the cross feed screw, first take off the cross feed handwheel bracket by removing its four attaching screws and then removing the handwheel bracket, handwheel and attached gear as a unit. Unscrew the nut from the front end of the cross feed screw, then remove the gear and bushing. Remove the screws holding the ball bearing and take out the bearing retainer. Then moving to the rear of the machine, remove the upright dust guard. Loosen the nut on the rear end of the cross feed screw and remove the rear thrust bearing. Going again to the front of the machine, rotate the cross feed screw until the front thrust bearing and sleeve on the rear end of the screw can be removed. After these have been removed, continue to rotate the screw until it is free of the machine. To reassemble, reverse the above procedure.

To remove the cross feed screw nut, move the slide to its extreme rear position. Remove the cover on the front of the cross slide and the two screws thus exposed that hold the positive stop plate for the nut. Remove the four screws which hold the bracket in place, turn the cross feed screw nut 90° and lift it out through the keyhole slot. The cross feed screw nut can then be disassembled from the bracket. After the nut and bracket are reassembled, and the bracket and screw replaced, it may be necessary to adjust the positive stop. After replacing the positive stop plate, loosen the setscrew on the left side and adjust the positive stop to allow the nut to mesh with the screw without bottoming in the thread.

Power Vertical Positioning Device. Drive for power vertical positioning is supplied through a belt to a pulley on the rear end of the vertical handwheel gear shaft. If the mechanism should fail to operate, the belt should be checked to see that it is in place and working properly.

Elevating Mechanism. To remove the elevating mechanism from the machine, raise the spindle head to

its extreme upper position and block it in place. The vertical handwheel bracket is then removed from the machine by taking out its four attaching screws and then removing the handwheel bracket, handwheel and attached gear as a unit. Remove the four bolts holding the gear and clutch operating assembly in place and remove this assembly as a unit. Loosen the set screw in the rear half of the clutch and slide this part off the end of the shaft. Take out the screws holding the bearing housing in place and remove the bearing housing and ball bearing. Take the V-belt off the pulley at the rear end of the shaft, loosen the pulley set screw and remove the pulley. Loosen the bearing set screw in the rear ball bearing and remove the bearing and bracket as a unit. The shaft may now be pulled out from the front of the machine. Moving to the top of the elevating screw, remove the nut and two washers. Remove the four screws, in the floor of the upright, that secure the elevating screw bracket to the under side. The elevating screw and bracket assembly will now drop down. Tip the screw toward the rear of the machine and remove it by unscrewing. With the screw removed, the elevating screw bracket assembly is easily lifted out. Reassembly is the reverse of the above procedure.

Adjustment of Timers. Timers located in the electrical controls cabinet act as time delays to insure that the vertical handwheel will be fully disengaged before the motors start when using vertical rapid positioning and to control braking of the motors. The vertical rapid positioning delay is in the lower left-hand corner of the electrical controls cabinet; the braking timer is in the lower right-hand corner. If the vertical handwheel spins when vertical rapid positioning is started, or if the brake does not take effect rapidly enough, the appropriate timer should be adjusted by turning its screw in the direction indicated to increase or decrease the time delay.

Table and Cross Feed Controls

These controls actuate the various hydraulic valves in the machine base either through control rods extending to the hydraulic panel or by actuating electrical switches in the feed case.

If the table fails to start after truing, return table throttle to OFF position. An electrical interlock will disengage the table circuit when dressing. The Cross Feed Selector must also be in GRIND to permit table to start.

If the cross feed fails to respond to the Directional Control Knob check the operation of the cross feed direction switches located in the control case.

No difficulty should be experienced with the other controls unless the rod linkage becomes loose or worn and thereby disturb the relation between the valve on the hydraulic panel and the control station.

For further information on the operation of the control valve see Chapter V describing the hydraulic system.

Possible Sources of Grinding Trouble

Work shows wheel marks (chatter finish). Chatter may be due to poor choice of wheel for the material being ground or the grinding wheel may be out of balance. If so, it should be replaced or balanced (see page 9).

The condition may be due to vibration of the floor or foundation on which the machine is located. If this is the case, the situation may be improved by using isolation mounts between the floor and the machine.

If the grinding wheel is not securely clamped to the wheel sleeve, repeated starting and stopping may shift the position of the wheel, resulting in chatter finish.

CHAPTER V

Hydraulic System

System Construction. The oil reservoir holds 23 gallons and is located in the base of the machine. Cast-in baffles aid in cooling the oil. There are two access plates; one at the front, the other at the left side of the base. The filler neck is built into the left side plate.

The main panel, located in the reservoir compartment (Fig. 19) with the high and low pressure relief valves, mounts the main valve body and four solenoid-operated, 3-way valves. The main valve body houses eight control valves, three of which are coupled to levers mounted on the control panel at the front of the machine.

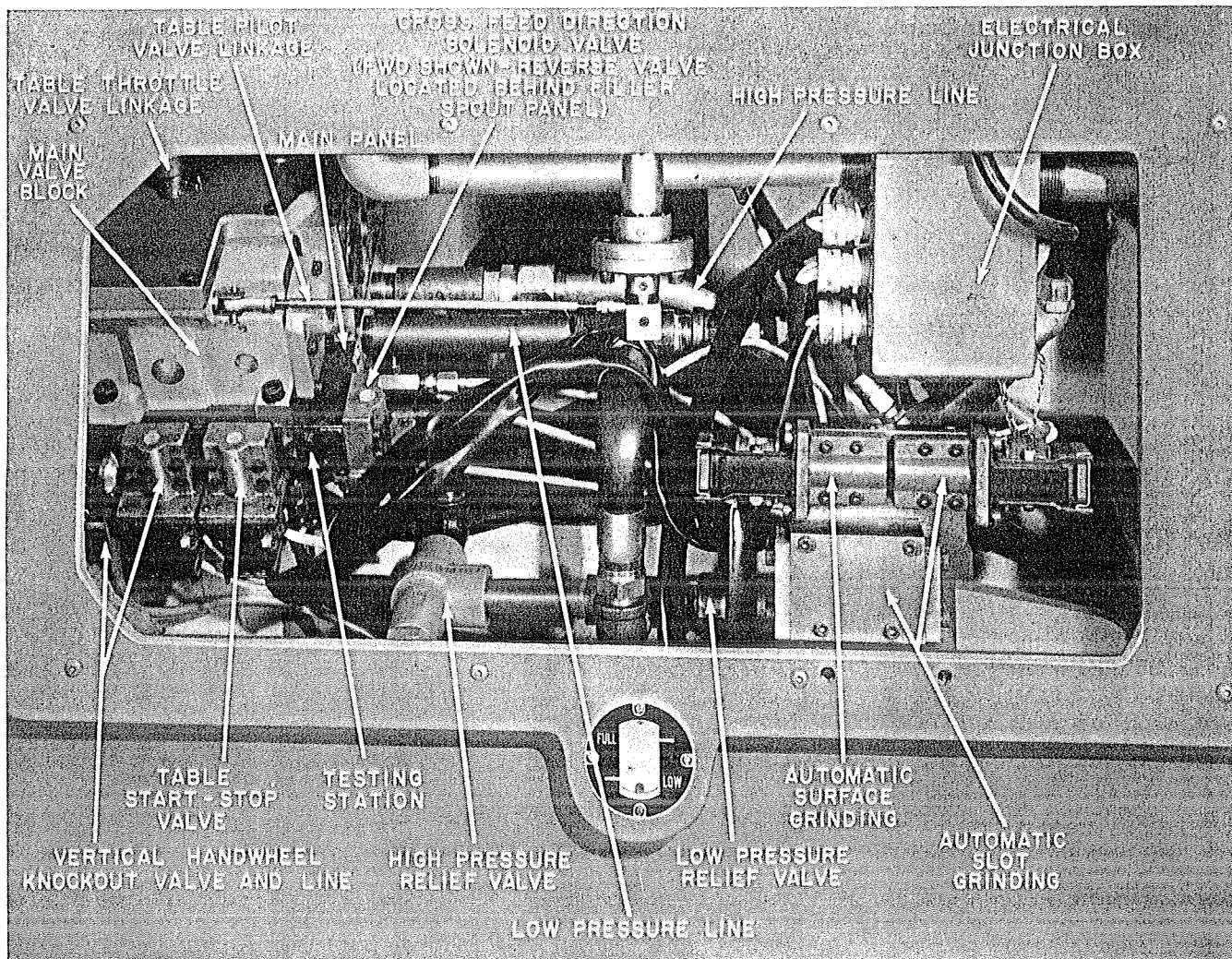
Another compartment, located in the right side of the base, (Fig. 2), houses the cartridge type filter and the positive displacement, gear type pump.

System Operation and Controls. Fig. 20 is a schematic diagram of the hydraulic circuit (also supplies oil for automatic lubricating system). The pump supplies the necessary power to actuate the following five cylinders: 1. Table Cylinder; 2. Table Handwheel Cylinder; 3. Cross Feed Cylinder; 4. Cross Feed Nut Cylinder; 5. The Down Feed Attachment Cylinder.

Operation of the pump is controlled by the main START and STOP push buttons located at the front of the machine.

There are four manual controls for system operation: 1. Table Speed Lever; 2. Cross Feed Selector Knob; 3. Cross Feed Amount Knob. 4. Cross Feed Directional Control Lever. These controls are located on the control panel.

Fig. 19. Hydraulic system components in reservoir compartment.



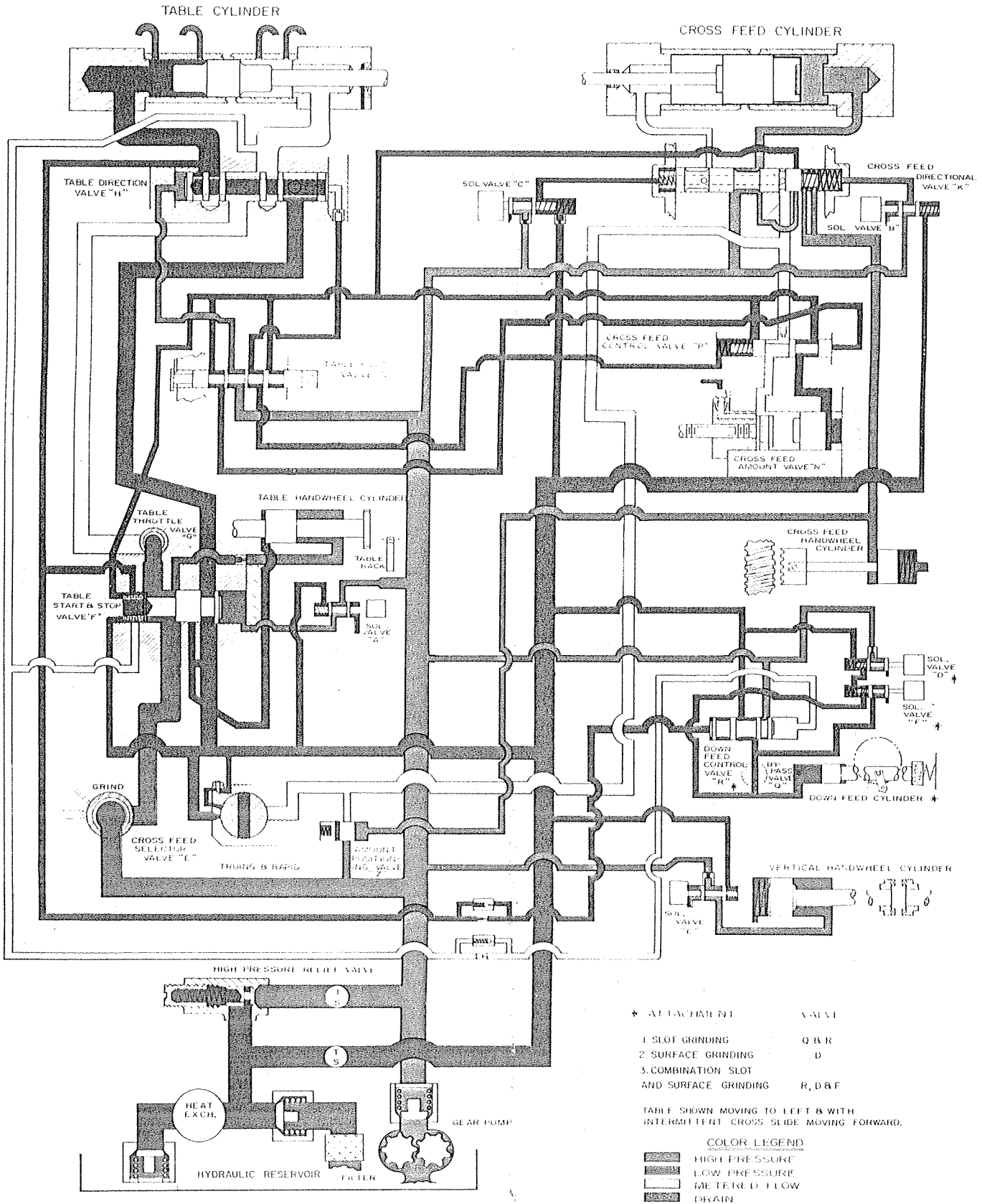


Fig. 20. Hydraulic system schematic diagram.

System Maintenance. The reservoir should be filled with approximately 23 gallons of clean, good grade, high lubricity, way and hydraulic oil having a viscosity of 150 S.S.U. at 100°F. (see page 7 for recommended oils). The by-pass filter cartridge and the oil should be renewed annually and the base compartments thoroughly cleaned to remove any foreign substance which may have entered the system. The bulk of the oil may be removed by connecting a flexible line from the pump discharge to a barrel outside the machine. A drain plug has been provided at the lower left side of the base to drain the remaining oil. When the reservoir is empty, wipe with a lint-free rag saturated with solvent.

When first starting a new machine, or after changing the oil, run the pump for about an hour with the table speed control in the OFF position. This will allow any contamination in the new oil to be filtered out and settled at the bottom of the reservoir. If the machine is not run for a long period of time, gum deposits may form in the valves causing the pistons to stick. If this happens, use one of the solvents available from several oil companies to flush out the system.

Adjustment of Pressure Relief Valves. There are two pressure relief valves which are adjusted and locked at the factory. If their setting is disturbed through some unforeseen circumstance or accident, they can easily be reset. By removing the 1/4" pipe plug in the panel, a pressure gage can be attached. With the table speed lever turned just enough to operate the solenoid, the high pressure should read 170 psi. If the pressure is too high, there is danger of overloading the pump motor.

The low pressure can be tested in the same manner. This pressure, as indicated on the panel, should read 5 psi.

Table Circuit. There are four valves necessary for the table circuit operation: 1. Table Start-Stop Valve; 2. Table Direction Pilot Valve; 3. Table Direction Valve; 4. Solenoid Operated Pilot Valve.

As the machine is started, oil is immediately pumped to the table start-stop valve. With the table speed lever in the extreme counterclockwise position, the oil is by-passed through the start-stop valve, through a fixed orifice and back to the reservoir setting up an immediate system pressure of approximately 50 psi. This intermediate pressure is maintained for actuating the start-stop valve. At this time the table leads are interconnected to permit manual operation.

To start the table, the cross feed selector knob must be in the GRIND position. The table speed lever is turned clockwise energizing a solenoid pilot valve which in turn controls the position of the start-stop valve. With

the start-stop valve in the position shown on the diagram, system pressure immediately rises to the high pressure relief valve setting. The table handwheel disengages and the table gradually increases in speed.

Table Reversing. There are two valves required for table reversal: 1. Table Pilot Valve; 2. Table Direction Valve. The pilot valve is mechanically operated by the table reversing lever which in turn is actuated by the table dogs. These dogs are adjustable. By actuating this valve, high pressure is directed to either end of the table direction valve. It is the relative position of this valve that governs the table direction.

Cross Feed Circuit. This circuit requires six control valves: 1. Cross Feed Selector Valve; 2. Cross Feed Direction Valve; 3. Cross Feed Amount Pilot Valve; 4. Cross Feed Amount Valve; 5. (2) Solenoid Operated Pilot Valves.

The cross feed selector valve is manually controlled by the cross feed selector knob which has three positions: GRIND, TRUE, and RAPID. In the GRIND position, oil is directed to the table circuit and the cross feed circuit. The truing and rapid positioning ports are closed off. To obtain cross feed motion in this position, a solenoid valve must be energized through the cross feed directional control lever.

This lever also has three positions: BACKWARD, OFF and FORWARD. In the FORWARD position, the right solenoid valve is energized permitting oil to flow to the right side of the cross feed direction valve, thus causing the spool to shift. High pressure is then directed to the back of the cross feed cylinder and to the cross feed nut, disengaging the nut from the screw. Oil from the rod end of the cross feed cylinder is routed through the cross feed control valve, which is hydraulically actuated at each table reversal, and then to the amount piston. The movement of the cross slide is directly proportional to the output volume of the amount valve. This volume can be adjusted by the Cross Feed Amount Knob. With the Cross Feed Directional Control Lever in the OFF position, the cross slide is manually controlled. Truing or rapid positioning can be obtained by the selector lever. This automatically locks out the table motion by cutting off the flow of oil. Motion is then started by the directional control lever as previously mentioned. The oil is metered back through the selector valve, and through an orifice (fixed for Rapid and adjustable for Truing).

Vertical Handwheel. The spindle head is equipped with a mechanically operated fast travel arrangement. When this is used, a solenoid operated pilot valve is energized to hydraulically disengage the handwheel clutch.

Operation and Maintenance

Optional Power Down Feed Arrangements

Automatic Slot Grinding to Positive Stop. When a machine is equipped with this arrangement, three changes must be made to the standard machine: 1. The vertical handwheel bracket must be replaced with a special down feed bracket. This bracket houses a spring loaded piston coupled to a pawl and ratchet arrangement and a shut-off valve. 2. A three way hydraulically operated valve and panel and 3. Three adjustable needle valves must be added.

When the table reverses, pressure is transmitted to either end of the down feed valve, causing the spool to shift and opening the cylinder to the high pressure momentarily to obtain a down feed. If the ports do not remain open long enough to get a full pick, the needle valve requires adjustment.

When this arrangement is in use, the Cross Feed Circuit is automatically locked out by an electrical switch in the elevating handwheel case.

Automatic Surface Grinding to Positive Stop. The following changes are necessary for this arrangement: 1. The vertical handwheel bracket must be replaced with a special down feed bracket. This bracket houses a spring loaded piston coupled to a pawl and ratchet arrangement. 2. A two position selector switch (ON and OFF) must be mounted on the electrical controls cabinet. 3. A solenoid controlled pilot valve and panel must be added.

To begin operation, the machine must be set for normal cross feed, and the selector switch placed in the ON position. The cross feed automatically reverses direction as the wheel comes off the work. At this point, the pilot

valve is energized, connecting the down feed cylinder to the high pressure. When the down feed cylinder completes its stroke, it contacts a limit switch, de-energizing the pilot valve and allowing the spring to reset the pawl.

Automatic Slot or Automatic Surface Grinding to Positive Stop. This combination of attachments requires the addition of the following parts: 1. The vertical handwheel bracket must be replaced with a special down feed bracket. This bracket houses a spring loaded piston coupled to a pawl and ratchet arrangement. 2. A three position selector switch (CROSS FEED REVERSAL, OFF and TABLE REVERSAL) must be mounted on the electrical controls cabinet. 3. A three way, hydraulically operated valve with two solenoid operated pilot valves, and three adjustable needle valves must be added.

With the selector switch in the OFF position, the machine can be operated as a standard machine.

For Automatic Surface Grinding, only one solenoid actuates at each cross feed reversal.

For Automatic Slot Grinding, the solenoid on the right stays energized at all times.

Hydraulic Maintenance. If any trouble occurs, the high pressure (170 psi) should be checked. If the pressure is too low, the relief valve is probably stuck open.

When first starting the machine, flush the air from the table cylinder and the cross feed cylinder. This will prevent erratic operation.

If the table fails to reverse properly, the trouble may be in the orifice located in the main valve body.

If the down feed is erratic when slot grinding, the needle valve may be clogged.

CHAPTER VI

Optional Mechanisms and Additional Equipment

Various optional mechanisms and items of additional equipment available as extras are described and illustrated in this chapter. Instructions are also given on their set-up and use. Optional mechanisms are built into the machine at our factory when specified by the purchaser. Additional equipment items may be purchased separately.

OPTIONAL MECHANISMS**0.000,1" Cross Feed Handwheel**

This handwheel has a fine feed knob mounted adjacent to it which is graduated to indicate transverse adjustment to 0.000,1". This feature is very helpful in precise slot or sidewheel grinding.

Fig. 21. 0.000,1" Cross Feed Handwheel.

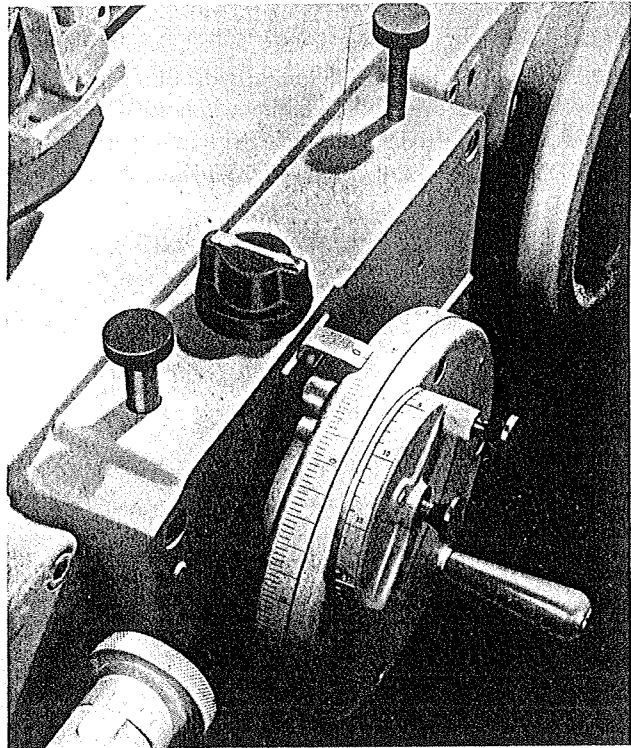
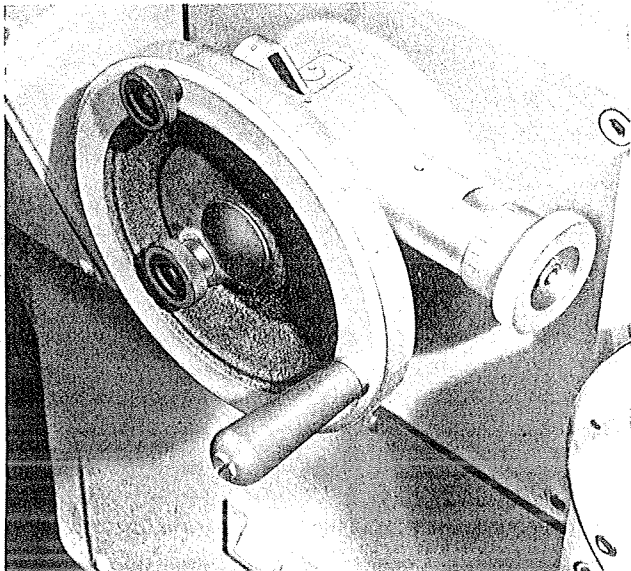


Fig. 22. Handwheel for Power Down Feed.

at each cycle until the elevating handwheel reaches a positive stop. When not required this stop may be retracted.

The increment of feed is controlled by a knob on top of the Elevating Handwheel Case at the left of the handwheel.

The feed cycle of the Slot Grinding Attachment is actuated at each reversal of the table. It is started by a lever located below the Elevating Handwheel on the front of the case.

The Surface Grinding Attachment feeds at each reversal of the cross feed and is controlled by a selector switch. The Combination Slot or Surface Grinding Attachment offers the option of either cycle described above and is also controlled by a selector switch.

Maintenance — The attachment is hydraulically powered. The feed is produced by a rotating picker and a ratchet located on the elevating handwheel shaft. If the picker tends to overtravel the ratchet wheel at the end of the stroke, and to feed more than the prescribed amount, the friction drag should be increased by turning the knurled screw on top of the handwheel case at the right of the elevating handwheel. This should be tightened

Extra Vertical Capacity Parts

Vertical adjustment is increased by using a 4½" raising block. This increases the height of the work ground to 19", when using a 12" diameter wheel.

Power Down Feed

Power Down Feed is supplied with three optional automatic cycles, the Automatic Slot Grinding Arrangement, Automatic Surface Grinding Arrangement and the Combination Automatic Slot or Surface Grinding Arrangement. Each arrangement will cause the grinding wheel to feed down vertically a predetermined amount

only enough to prevent the above condition without imposing excessive drag.

An electrical switch is contained within the elevating handwheel case. This switch, functions as a safety interlock to prevent carriage movement with the slot grinding attachment, and as a valve reversing switch with the other attachments. If there is adequate hydraulic pressure but the down feed does not operate when turned on, this switch could be the cause. For further information see Chapter V on hydraulic operation and maintenance.

Vertical Position Indicator

This attachment is intended primarily for use in setups where the wheel head must be raised from the work and brought back to the original position with accuracy.

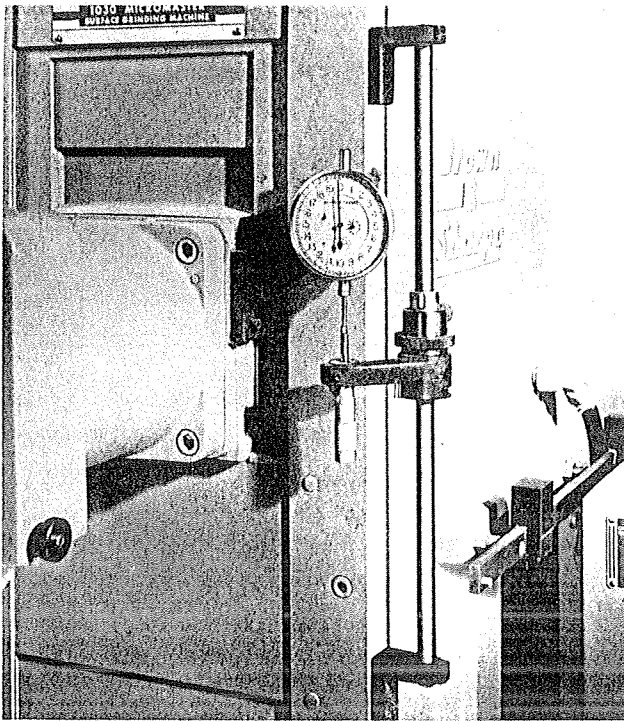


Fig. 23. Vertical Position Indicator.

A large easily read indicator dial is mounted on the wheel head and a micrometer serves as the stop to provide fine accurate adjustment. The micrometer stop is adjustable for the entire range of vertical adjustment and can be retracted to by-pass the stop without destroying the setting.

ADDITIONAL EQUIPMENT

Exhaust Attachment

This attachment removes grit and dust-laden air from the region of the grinding operation and separates out the

foreign matter, leaving the air well-cleaned. It is readily moved from one machine to another, and is recommended for all dry grinding operations as a means of providing the necessary protection to the operator and machine.

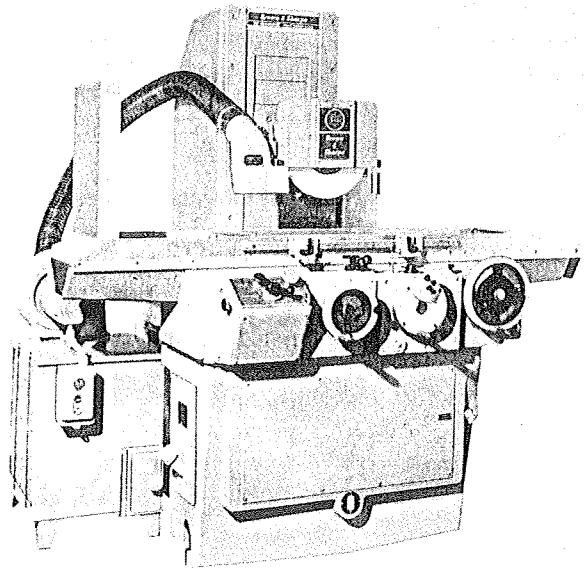


Fig. 24. Exhaust Attachment.

The motor-driven fan on the separator tank draws the air at high speed through a flexible pipe from an adjustable exhaust nozzle attached to the wheel guard and blows it into a spiral separator, where the heavier particles are removed by centrifugal force. The air then passes slowly out through two viscous-coated renewable filter pads which remove the remaining finer particles. The separator chamber is emptied through the vertical sliding gate at the right front of the tank, while the filter pads are released for replacement by lifting out the two vertical rods which hold them in position.

For most efficient dust removal, adjust the position of the exhaust nozzle on its supporting stud so as to keep the nozzle close to the work.

The $\frac{1}{4}$ H.P. fan motor is controlled by a starting switch having overload protection, and is designed to be connected directly to the power line

Exhaust Nozzle

For Use with Central Plant Exhaust System

The Exhaust Nozzle offers a convenient means for connecting the machine to a central exhaust system. A special stud is included for attaching the nozzle to the

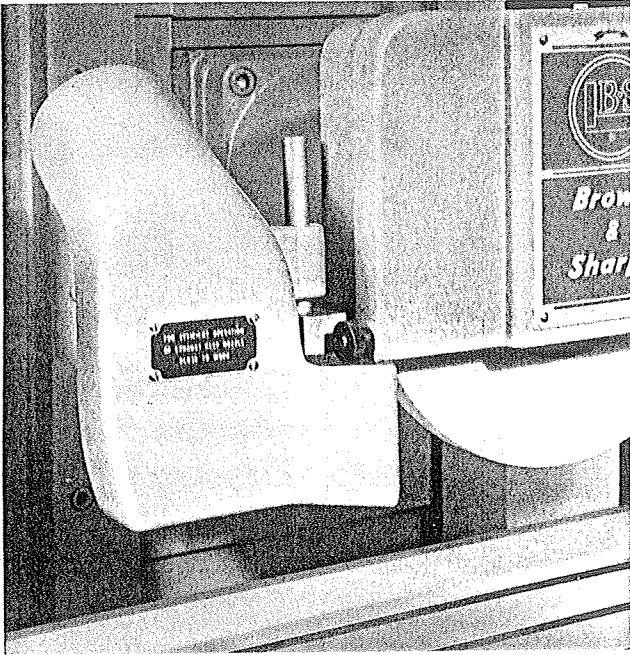


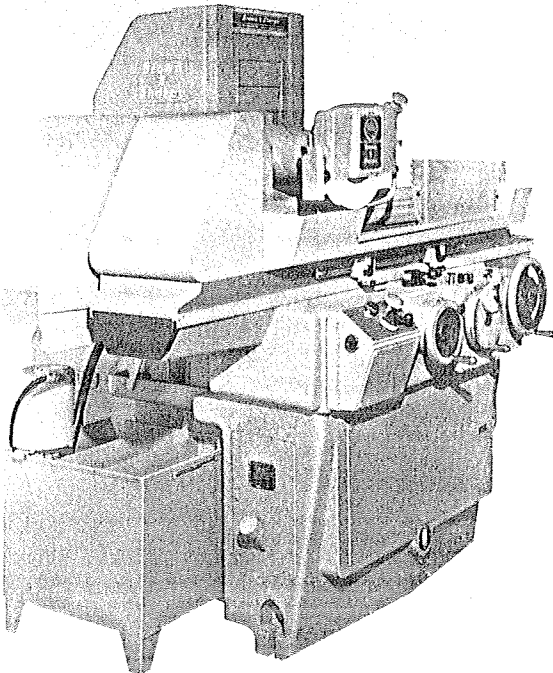
Fig. 25. Exhaust Nozzle for use with central plant exhaust system.

wheel guard of the machine and permits adjusting the position of the nozzle. A flexible pipe with a 4" hole is used for connecting to exhaust system.

Wet Grinding Attachment

The Wet Grinding Attachment pump motor connects into a receptacle at the back of the machine. This recep-

Fig. 25. Wet Grinding Attachment.



tacle is energized by the START button on the right side of the machine.

With the Wet Grinding Attachment, coolant is supplied to the wheel through a nozzle and flexible piping from a ¼ H.P. motor-driven centrifugal pump mounted in the supply tank. A plug, receptacle, overload relay and wiring are included.

The working surface of the table is surrounded by a three-piece overlapping splash guard, a guard for the right end, and the deflector at the left end of the table.

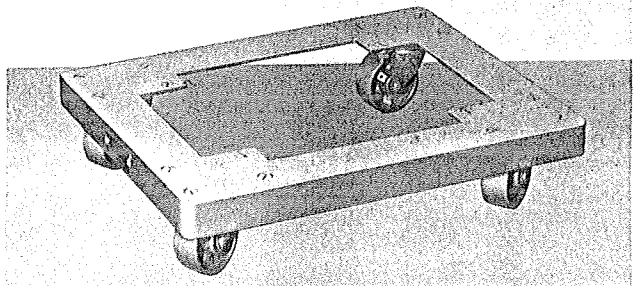
Coolant collects in the table channels and is delivered to a trough in the bed at the rear of the table which then discharges into a trough at the side of the machine and goes to the supply tank through a flexible hose. The 18-gallon floor type tank is of welded steel and has a two-plate removable baffle unit which provides for efficient settling.

Castered Base For Use with Wet Grinding and Exhaust Attachments

This castered base or dolly provides a ready means of moving the coolant tank or separator tank to other machines or to a convenient place for emptying and cleaning. It is sturdily constructed of heavy steel, is equipped with ball bearing casters and fits into the corners formed by the feet of the tank, raising the feet about ¼" off the floor to permit free movement.

It measures 19½" long, 15½" wide and 3¾" high.

Fig. 27. Castered Base.



4¾ Inch Index Centers

These Index Centers permit accurate indexing of the more common circular divisions, facilitating 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

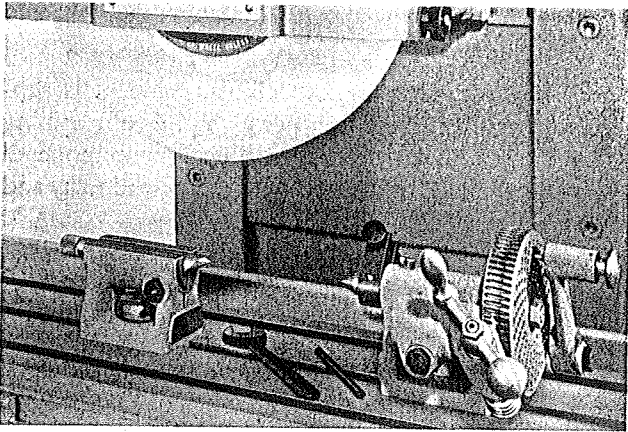


Fig. 28. 4 3/4 Inch Index Centers.

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.

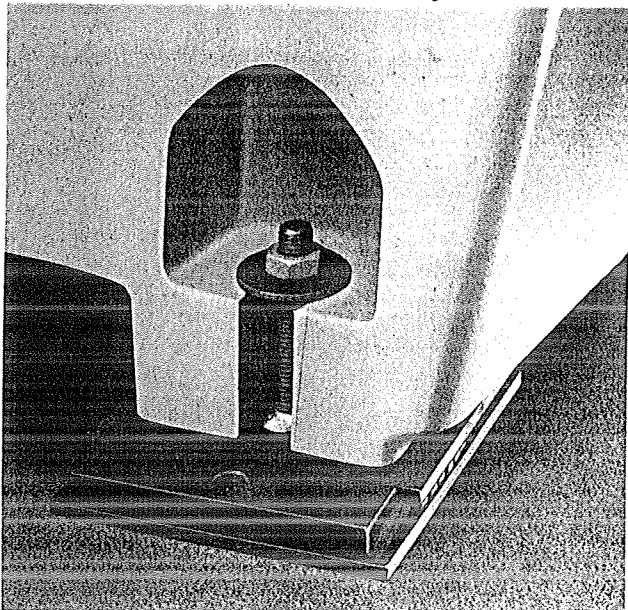
The centers swing work up to 4 3/4" diameter. Used with raising blocks (available at extra cost), the centers swing work up to 8 1/4" diameter.

Centers having reversible tongues for T-slots 1/2" or 9/16" wide.

Isolation Mountings

This set of four mountings will eliminate the need for expensive machine foundations by completely isolating the machine from external vibration.

Fig. 29. Isolation Mounting.

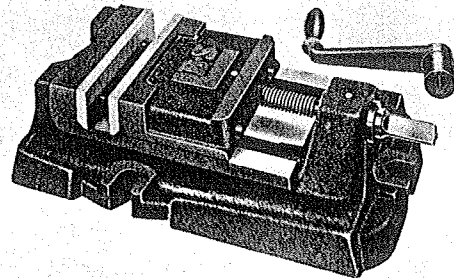


No. 421-4 Flanged Vise

This vise can be clamped at right angles or parallel to the wheel spindle.

The removable jaws are of tool steel, hardened and ground, 4 1/4" wide and 1 1/8" deep, and open 2". Distance from bottom of base to top of jaws is 3".

Fig. 30. No. 421-4 Flanged Vise.



No. 101-5 Adjustable Vise

The vise proper is mounted on a hinged base and can be set and clamped at any angle in the vertical plane up to 90°, a dial graduated to degrees indicating the setting. Removable tongues in the base provide for aligning the jaws parallel to the table T-slots.

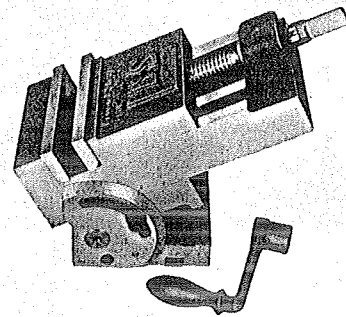


Fig. 31. No. 101-5 Adjustable Vise.

The removable jaws are of tool steel, hardened and ground, 4 1/4" wide and 1 1/8" deep, and open 2". Distance from bottom of base to top of jaws with vise horizontal is 4 5/8".

No. 202 Adjustable Swivel Vise

This vise can be clamped to the table with 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° each side of horizontal. The latter setting is indicated by a scale graduated in degrees and is clamped by the nut at the right.

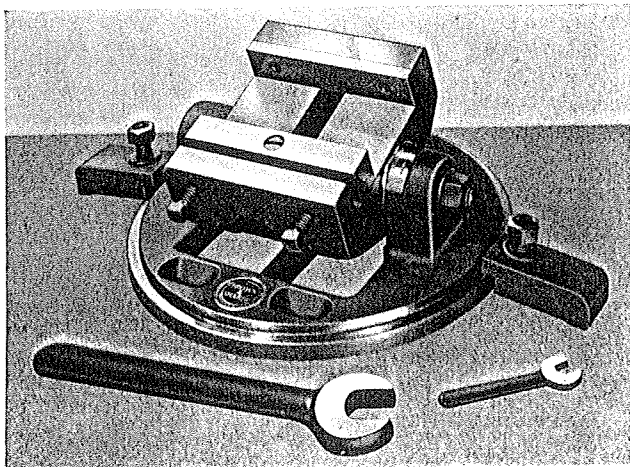


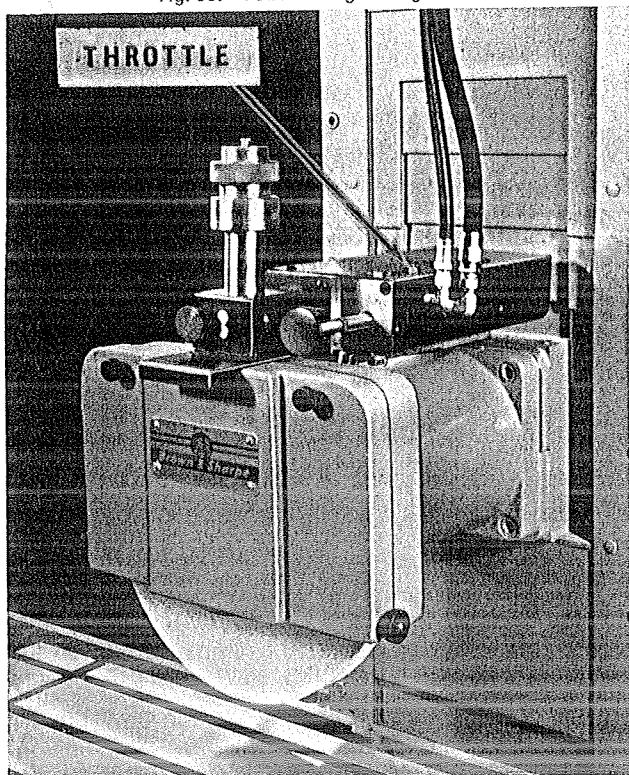
Fig. 32. No. 202 Adjustable Swivel Vise.

The hardened tool steel jaws are 5" wide, 1" deep and open $2\frac{3}{4}$ ". 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".

Power Truing Arrangement

This arrangement consists of a diamond mounted on a hydraulically driven slide above the grinding wheel, together with the necessary controls to provide semi-automatic operation. It provides a smooth traverse of

Fig. 33. Power Truing Arrangement.



the diamond across the grinding wheel (up to 2" wide) at a uniform speed without disturbing work or fixtures mounted on the machine table.

The diamond is mounted in a vertical sleeve which includes a feed screw that provides one inch of vertical movement. When dressing a new wheel the diamond should be retracted to the limit of the screw and the entire sleeve lowered by releasing the clamp screw at the front of the attachment. The sleeve should be reclamped with the diamond close to the wheel. From this point the movement can be accurately determined by the graduated knob at the top of the sleeve.

The path of the diamond across the wheel is controlled by a jack screw and two clamping screws at the rear of the attachment. These should be adjusted to give a true path parallel to the wheel spindle.

To dress the wheel the cross feed selector knob at the left front of the machine is set in the "True" position, the crossfeed direction lever at "Off" and the attachment knob pressed in. The attachment will make one complete cycle consisting of a pass toward the front of the wheel, automatic reversal and a pass back to the rear of the wheel. The length of the stroke can be adjusted by screwing the operating knob in or out to allow the reversing fork to contact the knob at a different position.

The speed of the stroke can be varied from 2 to 15 inches per minute by adjusting the throttle located at the top of the reversing valve (Fig. 33). Rotating the screw counterclockwise will increase the speed.

Over-The-Wheel Truing Attachment

The Over-The-Wheel Truing Attachment greatly reduces the time required for wheel truing. It can be used on the majority of everyday jobs where *extreme* accuracy is not required. With this attachment the diamond remains close to the wheel, ready for immediate use and the work-piece remains undisturbed beneath the wheel.

Before using the attachment the top of the template on the right-hand side (beneath the ball handle) must be made parallel to the top of the table. This is done by using a dial indicator mounted on the machine table and moving the spindle slide upright transversely. Any adjustment necessary is made by means of the two screws upon which the template rests.

Also, the pivot for the arm with the ball handle should be centered (approx.) on the width of the wheel being trued. This is accomplished by loosening the knurled clamp screw on the left side of the attachment and turning the knurled ring at the top of the eccentric bushing to bring the pivot central with the width of the wheel.

To start the initial truing, the scale at the top of the

attachment is turned to read zero. The knurled screw at the front is then loosened, the diamond carrier clamped. The ball handle at the right of the attachment is then moved back and forth with the stylus beneath it in contact with the template. This moves the diamond across the wheel to true it.

After the initial truing of the wheel, the operation of this attachment is extremely rapid. The diamond is fed

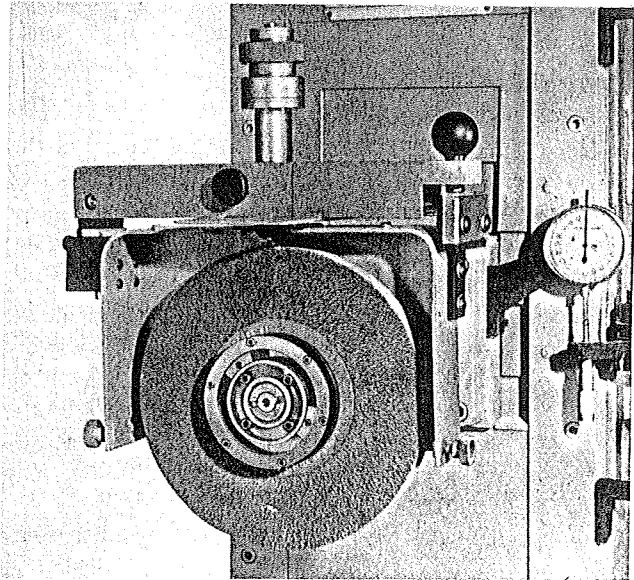


Fig. 34. Over-the-Wheel Truing Attachment shown with wheel guard cover removed.

into the wheel by turning the knurled knob at the top of the attachment. Then the diamond is passed across the wheel by moving the ball handle. After the wheel is trued, the wheel is lowered an amount equal to that trued off the wheel as indicated on the scale at the top of the attachment. This brings the grinding surface of the wheel into the same position with relation to the surface being ground as it was before the wheel was trued.

Included with this attachment are (1) a special wheel guard and cover, (2) a coolant nozzle and bracket for use when the attachment is used with a Wet Grinding Attachment.

The diamond (approximately one carat) 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" radius and face angles up to 90° either side of zero, and permits combinations of radial and angular shapes to be developed.

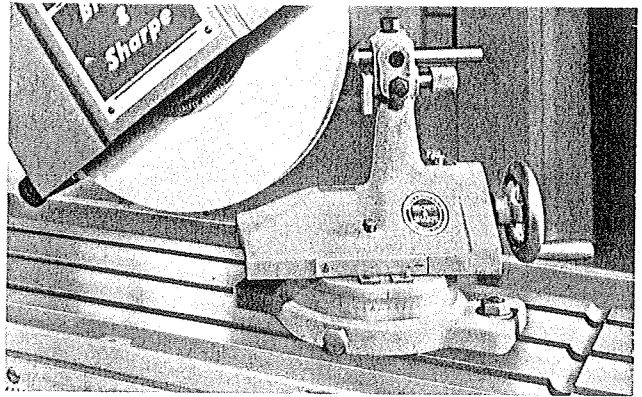


Fig. 35. Radius and Angle Wheel Truing Attachment.

The base of the attachment carries a swivel platen upon which is mounted a slide which can be moved longitudinally 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, locating the diamond point by means of the diamond tool setting gage. 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 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 the 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.

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. Convex radii up to 1/2", with tangents to 5/8" in length in any direction from parallel to the side of the wheel to 110° away from the side, can be formed. Concave radii from 1/32" to 1" (larger radii with diamonds having longer holder than one furnished), having tangents up to 5/8" long in any direction from 70° to

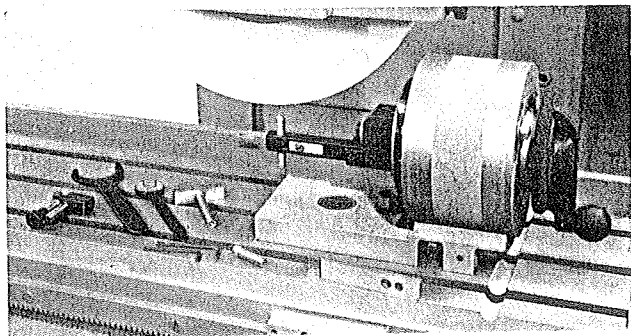
180° away from the side of the wheel, can also be formed. The angles of the tangents are independent of each other (on a concave shape having a radius over $\frac{3}{8}$ " the included angle must be 90° or more).

Concave radii less than $\frac{5}{32}$ " and all concave radii $\frac{3}{8}$ " or less having the included angle of the tangents less than 90°, require diamond tools other than the one furnished.

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 $\frac{1}{2}$ " or $\frac{9}{16}$ " wide. These tongues are easily removed when the attachment is to be used on a magnetic chuck.

Detailed instructions furnished on request.

Fig. 36. Continuous Radius and Tangent Wheel Truing Attachment.



Magnetic Chucks

The Brown & Sharpe Nos. 824-1, 1024, 1030, and 1224 rectangular-model Permanent Magnet Chucks provide a quick, easy means of holding a variety of ferrous work for surface grinding. A 180° 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 desired without heating.

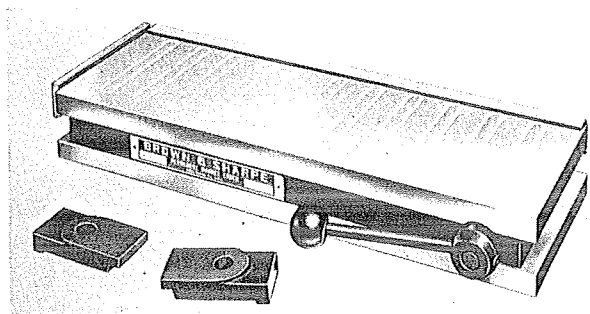


Fig. 37. Permanent Magnet Chuck.

For highest accuracy in grinding work parallel, the top surface of the chuck should be ground each time the chuck is mounted on the machine. Be sure that the chuck

is turned on before doing this, and remove only the minimum amount of metal required to grind the entire top surface.

The chuck should not be subjected to excessive heat, shocks or blows, and the top should be kept free from pits and scratches. Regrind the top surface occasionally if necessary, as a smooth surface is essential for grinding work parallel.

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

Wet grinding is preferable to dry grinding if the machine is equipped for this in order to reduce the possibility of distortion in the top plate which might be caused by heat from the grinding.

The No. 824-1 chuck is $2\frac{3}{16}$ " high and has a working surface of 8" x 24". The No. 1024 chuck is $2\frac{5}{8}$ " high with a working surface of 10" x 24". The No. 1030 chuck is $2\frac{5}{8}$ " high with a working surface of 10" x 29 $\frac{3}{4}$ ". The No. 1224 chuck is $2\frac{11}{16}$ " high with a working surface of 12" x 24".

Electromagnetic chucks and controlling equipment are also available. Information on application.

Neutrofier, for use with electromagnetic chuck, is also available. Information on application.

Sine Plates and Perma-Sines

The Brown & Sharpe Inspection Sine Plates offer reliable means for establishing precise angles for surface grinding, for tool making, for inspection — for work wherever precision angular settings are required. With an overall accuracy within 0.000,2", they give angular settings at gage block accuracy.

Simple and Compound Sine Plates are available in 5" and 10" sizes. The simple 5" size working surface is 3 $\frac{1}{2}$ " x 6", the 5" compound working surface is 6" x 6". The 10" size working surface is 6" x 11".

Sine plates are furnished with side and end plates, held in place by knurled-head screws and have tapped holes in their sides, ends and top for the application of clamps or other holding devices.

Lower hinge on compound plates can be furnished on opposite end if desired at no extra cost.

A Brown & Sharpe No. 510 Permanent Magnet Chuck can be used with either 10" Sine Plate by adding two bolt

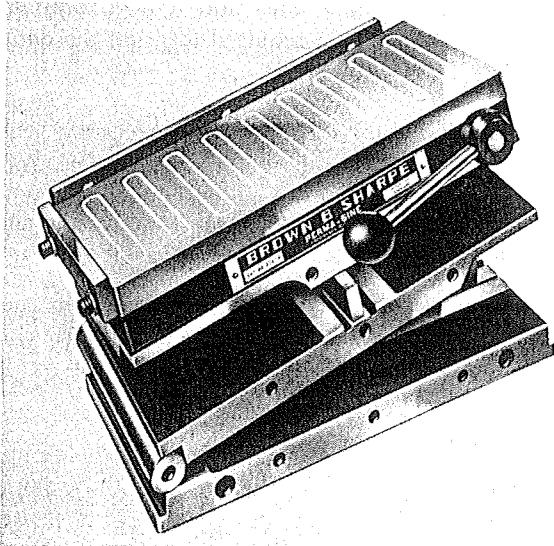


Fig. 38. Compound Perma-Sine Plate.

holes to the base of chuck. When ordering chuck for this purpose so specify.

The Simple and Compound Perma-Sines (permanent magnet sine plates) are available in the 5" and 10" sizes. The 5" simple and compound plates have a working surface 6" x 6". The 10" simple and compound have a working surface of 6" x 12".

With an overall accuracy within 0.000,2" all over, they give angular settings at gage block accuracy.

No electric connections are needed and the holding power is turned on or off by a turn of the lever.

The compound plate is superbly suited for complex angles.

Perma-Sines are furnished with both end and side plates, held in place by knurled-head screws.

Lower hinge on compound plates can be furnished on opposite end if desired at no extra cost.

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. Full-time visibility of the work is provided.

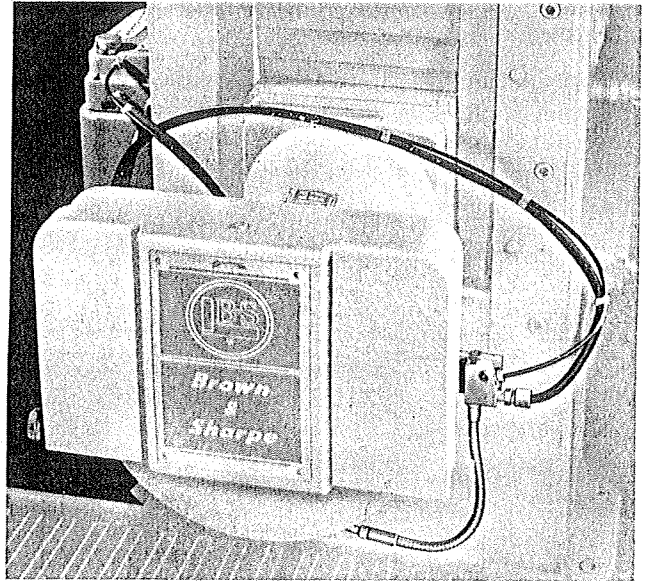


Fig. 39. Mist Coolant Arrangement.

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

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

The Brown & Sharpe line includes the following:

Milling Machines — Plain, Universal, Vertical, Rangemaster.

Grinding Machines — Plain, Universal, Surface, Universal and Tool.

Screw Machines — Ultramatic, Ultramatic Forming and Cutting-Off, Ultramatic Chucking.

Turret Drilling Machines — Manual, Semi-Automatic, Automatic, Tape-Controlled.

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

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.

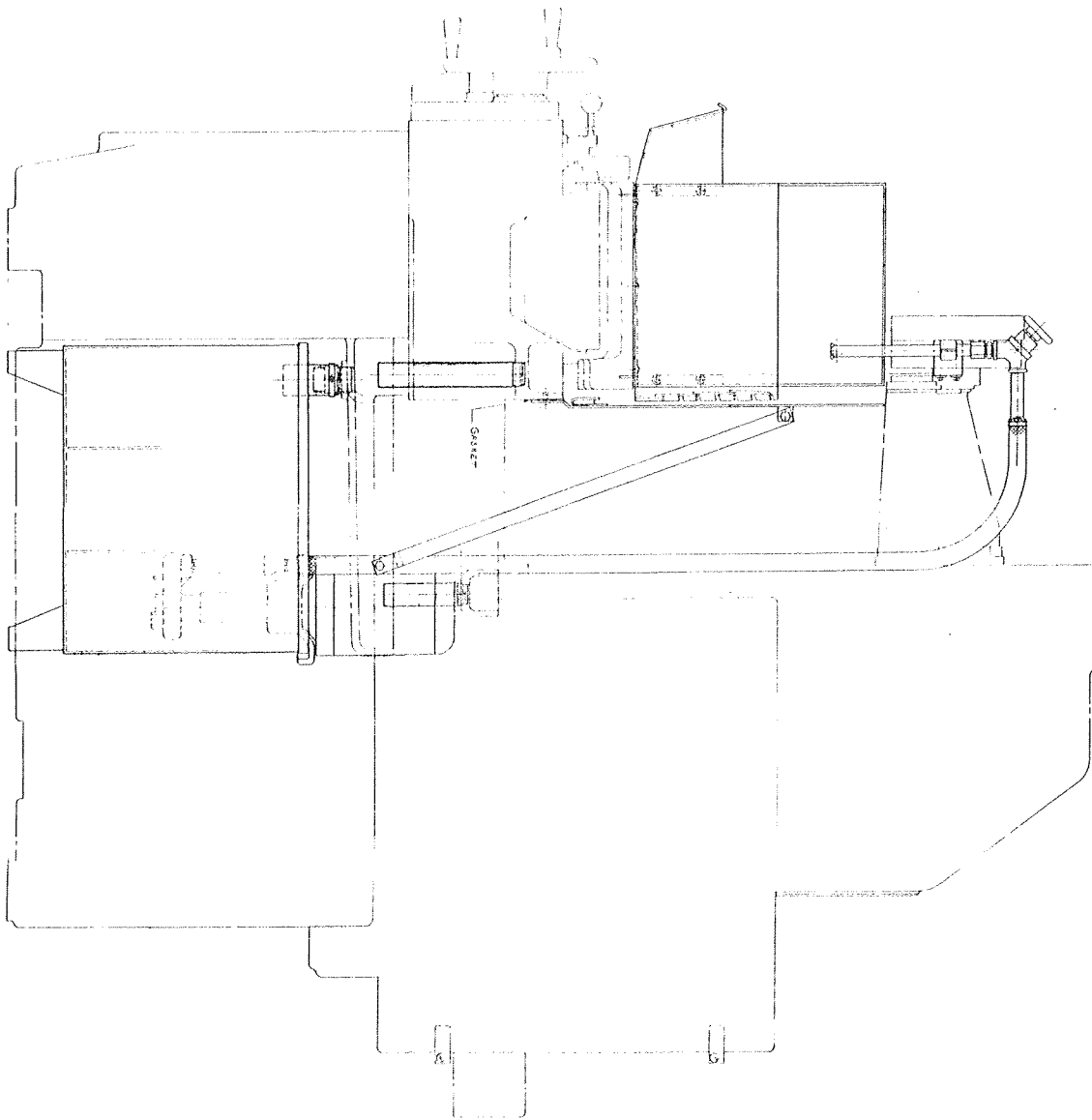
Vises — Plain, Flanged, Swivel, Toolmakers' Universal.

Hydraulic Products — Pumps, Valves, Power Units.

BROWN & SHARPE MFG. CO.

Precision Park, North Kingstown, R. I., U. S. A. 02852

R. H. ELEVATION



TITLE

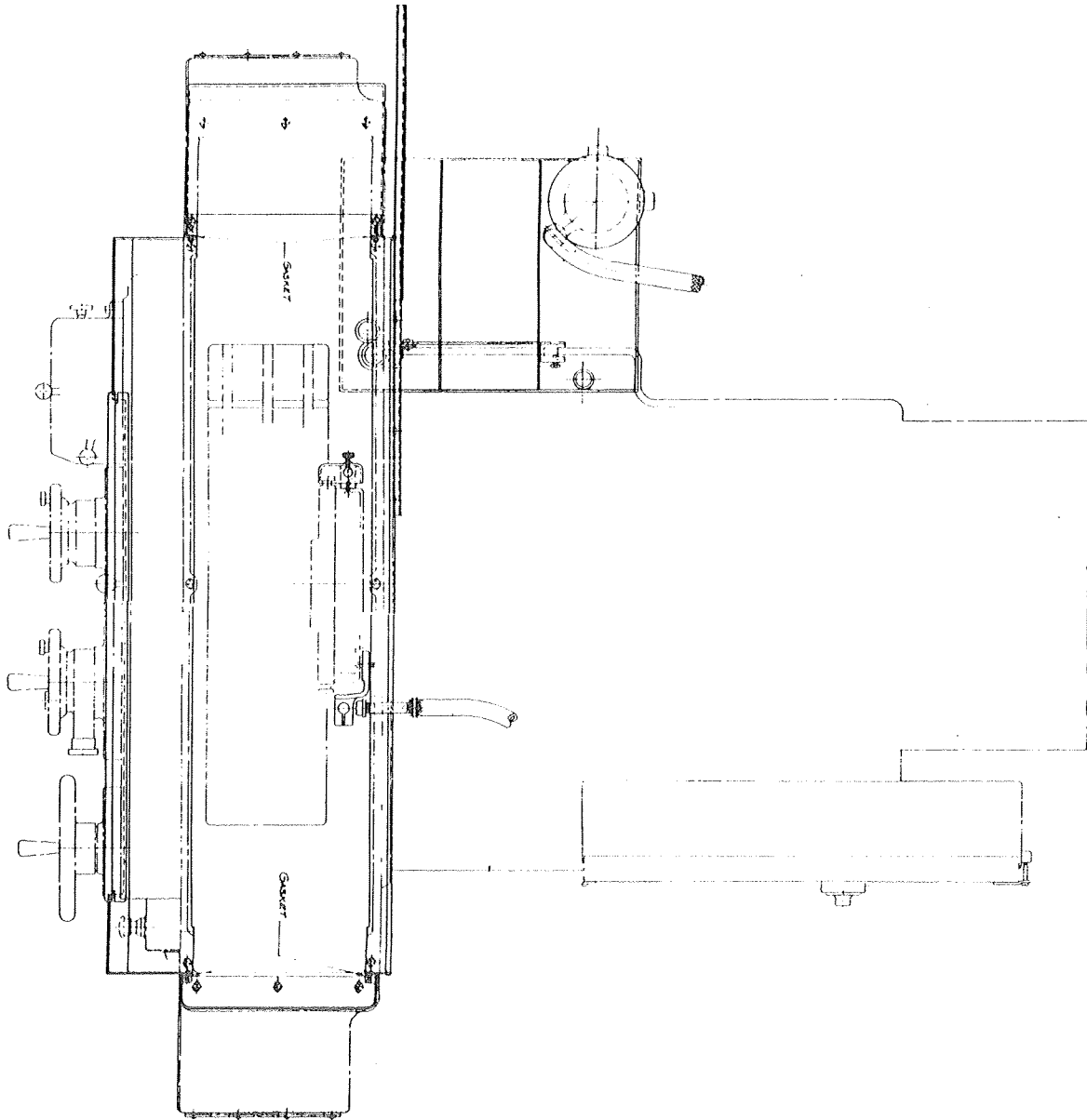
INSTRUCTIONS FOR ASSEMBLY TO MACHINE

PRODUCT NAME WET GRINDING ARRANGEMENT FOR NO. 824 SURFACE GRINDING MACHINE
SERIAL NO.

BROWN & SHARPE MFG. CO.
PROVIDENCE, R. I., U. S. A.

DRAWING NO.
820-427-309

PLAN VIEW



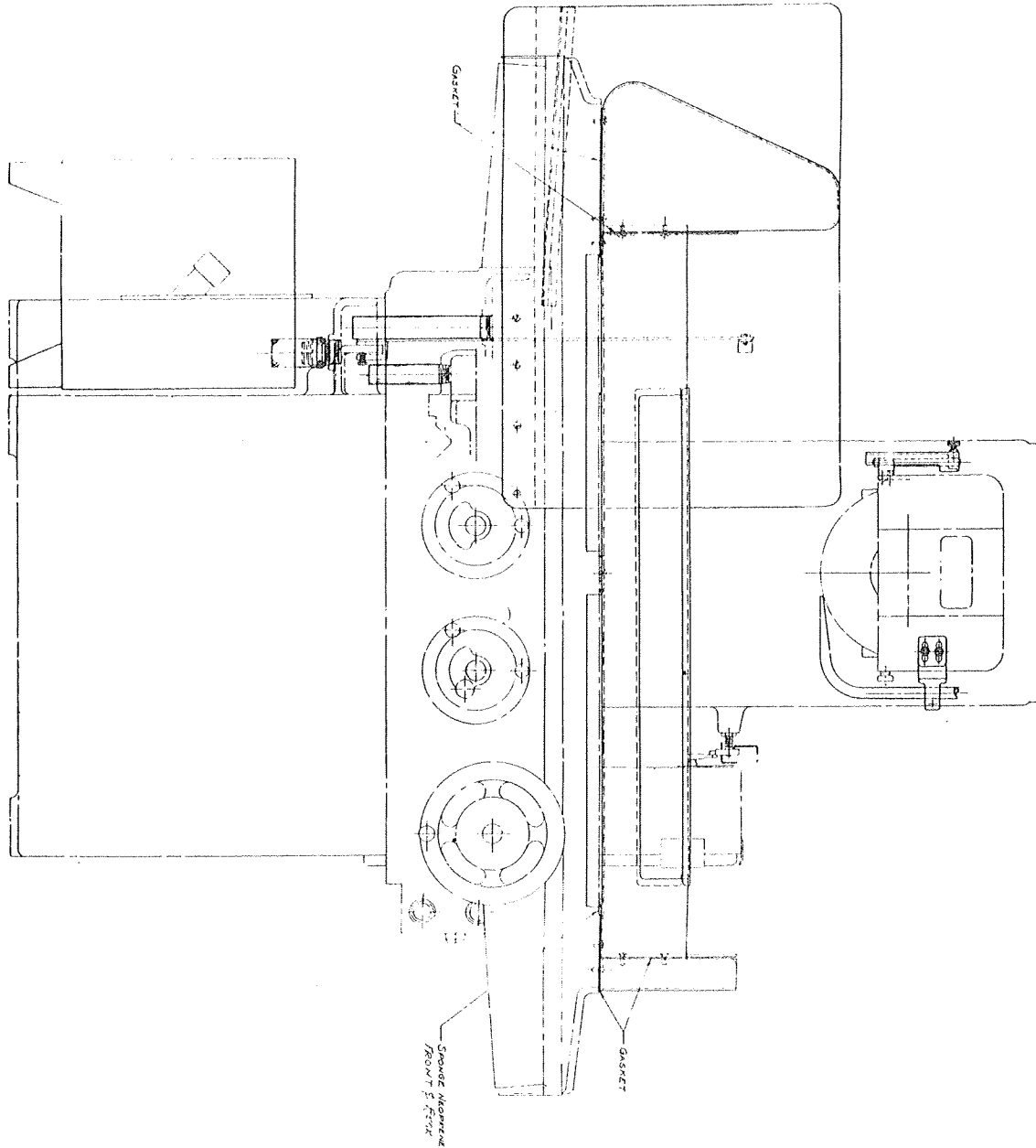
TITLE INSTRUCTIONS FOR ASSEMBLY TO MACHINE

PRODUCT NAME WET GRINDING ARRANGEMENT FOR
SERIAL NO NO. 824 SURFACE GRINDING MACHINE

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PROVIDENCE, R. I. U S A.

DRAWING NO.
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FRONT ELEVATION



TITLE INSTRUCTION FOR ASSEMBLY TO MACHINE

PRODUCT NAME WET GRINDING ARRANGEMENT FOR NO. 824 SURFACE GRINDING MACHINE
SERIAL NO.

BROWN & SHARPE MFG. CO.
NORTH KINGSTOWN, R. I., U.S.A.

DRAWING NO.
820-426-309

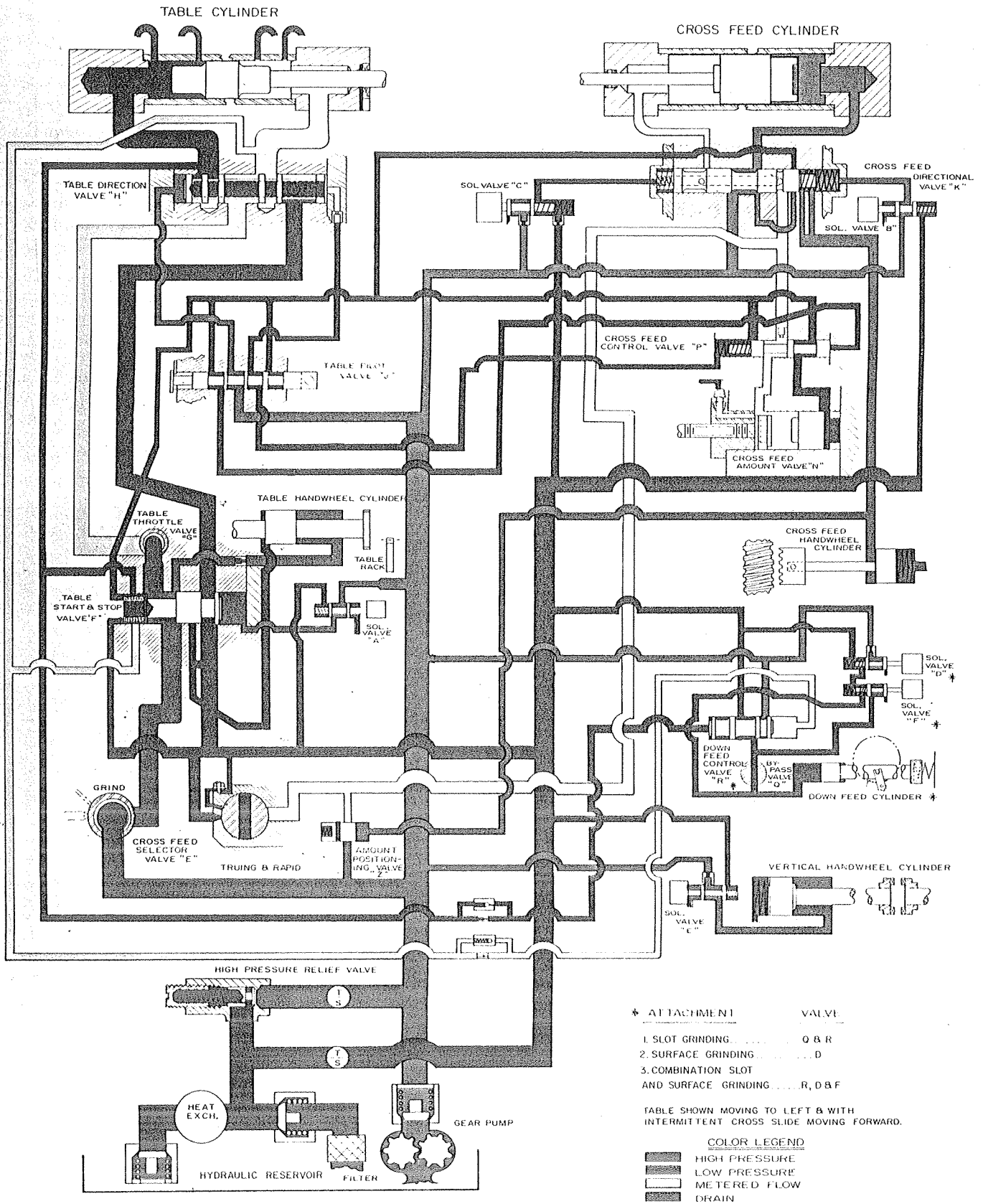


Fig. 20. Hydraulic system schematic diagram.