DESCRIPTION OF BENCH or FLOOR GRINDER

DESCRIPTION OF GRINDING WHEELS

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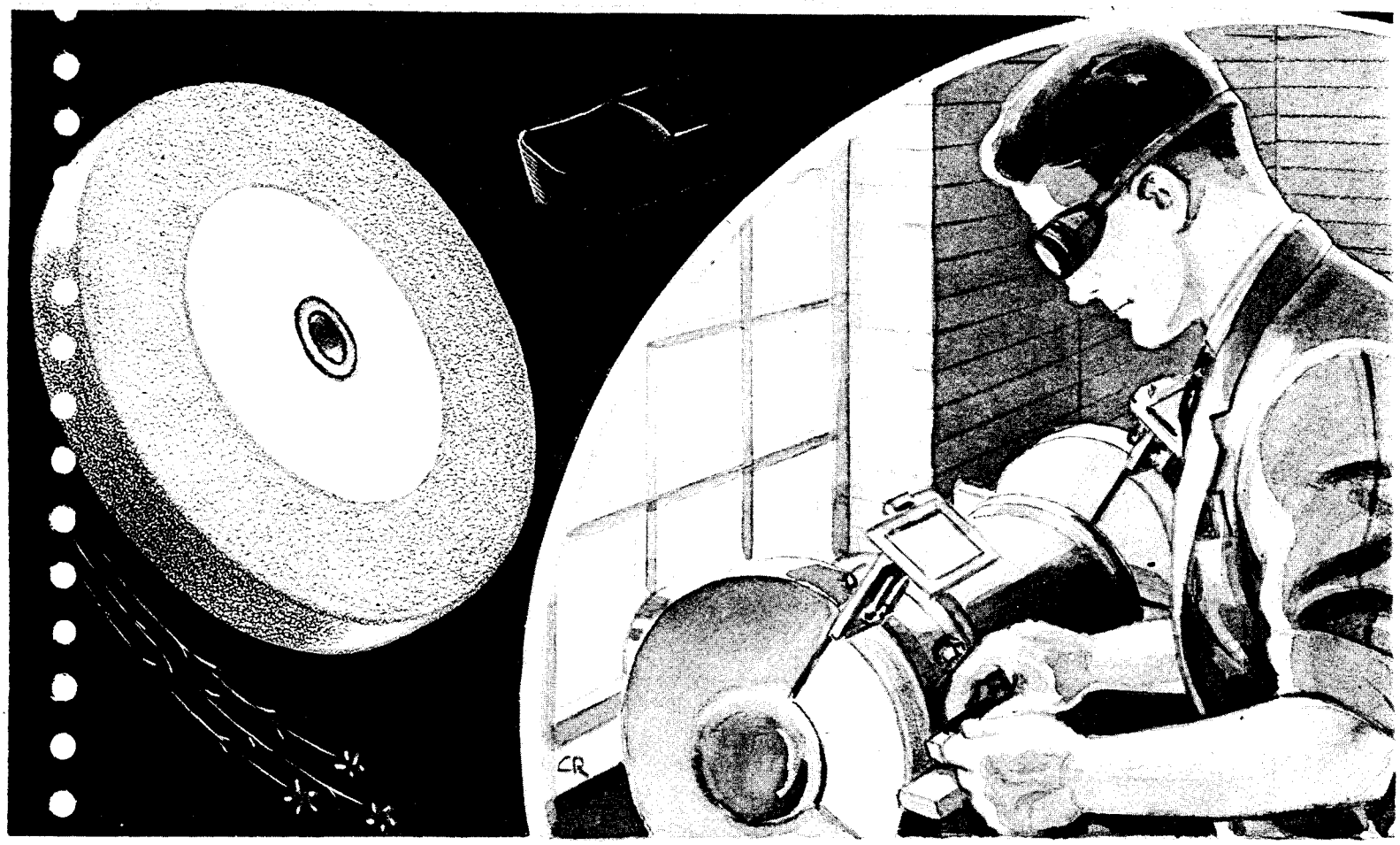


UNIVERSITY OF THE STATE OF NEW YORK
STATE EDUCATION DEPARTMENT
BUREAU OF INDUSTRIAL AND TECHNICAL EDUCATION

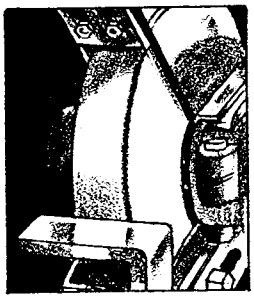
DESCRIPTION of BENCH or FLOOR GRINDER

OBJECTIVES OF UNIT

1. To give a general description of the principal parts of the bench or floor grinder.

2. To give a description of the grinding wheels used on the bench or floor grinder.

INTRODUCTORY INFORMATION



Bench and floor grinders are especially designed to hold and revolve the grinding wheel and at the same time to steady the hand of the operator and give support to the tool while it is being ground.

Inasmuch as the grinder operates at high speed, usually between 5000 feet and 6000 feet per minute, various protective devices are provided to guard the worker against wheel breakage and flying particles caused by the grinding process.

These protecting devices include wheel enclosures, or guards, safety-glass eye shields, and, frequently, an exhaust system to remove fine particles of abrasives from the air in the vicinity of the wheel.

The grinding wheel which is mounted on the grinder is made up of small, hard, irregularly shaped granular particles with sharp edges, called the abrasive, and a substance which holds the particles together, called the bond.

The ingredients are thoroughly mixed and then placed in molds of various shapes and sizes to form wheels. Subsequently the wheels are subjected to a process of fusing the bonding material in order to hold the particles together and to withstand the stresses due to the grinding procedure. Afterwards, the wheels are trued in a lathe, and the arbor hole is bushed with lead. Finally, the wheels are tested and graded.

DESCRIPTION OF THE BENCH OR FLOOR GRINDER

The bench grinder (Fig. 527) is designed primarily to be used on a bench. The same grinder, however, can be mounted on a pedestal and converted into a floor type (Fig. 528). The grinder, then, can be placed in any convenient location where it will be accessible easily from all sides. Although tool grinders of the belt-driven style are still in use, they are being replaced rapidly by

the ball-bearing, motor-driven type.

Grinders may be purchased with motors of 1/4 HP upwards, but for general tool grinding the machine should be equipped with at least a 1 HP motor. The motor shaft, or spindle, extends beyond each side of the motor. It is upon these extensions that the two wheels are mounted.

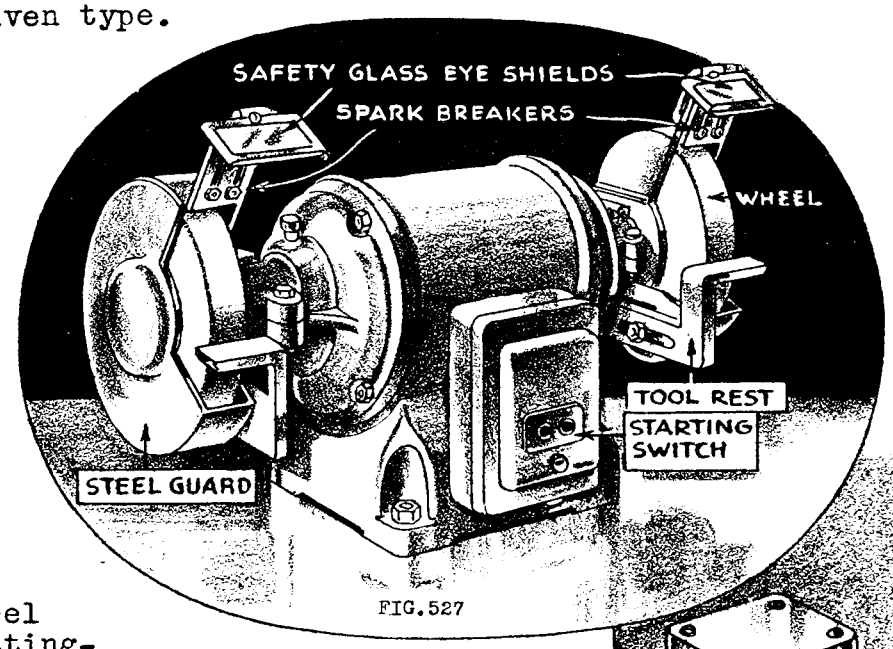


FIG.527

The wheels are held between two flanged collars, or discs, (Fig. 529) with blotting-paper washers between the sides of the wheel and the collars. The blotting-paper washers will absorb any unevenness in the wheel and will lessen the danger of setting up strains which might cause the wheel to crack. The grinder spindle has a right-hand thread on the right end and a left-hand thread on the other. When a grinder is viewed from the right-hand end (Fig. 531), the small arrow on the spindle indicates the direction that the spindle is turning; the middle arrow indicates the direction that the nut must be turned to tighten the wheel to the spindle. When the tool is being ground, the pressure against the grinding wheel tends to force the wheel in the direction of the third arrow. Since the wheel and the nut have a tendency to turn in the same direction, any movement of the wheel will turn the nut also and will cause it to tighten.

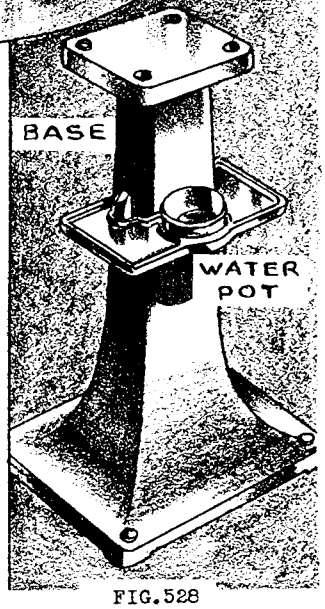


FIG.528

Conversely, when the grinder is observed from the left side, the shaft turns in a clockwise direction (Fig. 530). Since the pressure of the grinding process tends to turn the wheel counterclockwise, as indicated by the outer arrow, the nut also will be turned in the same direction. If this end of

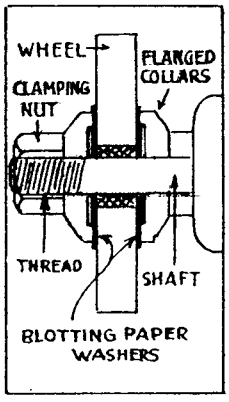


FIG.529

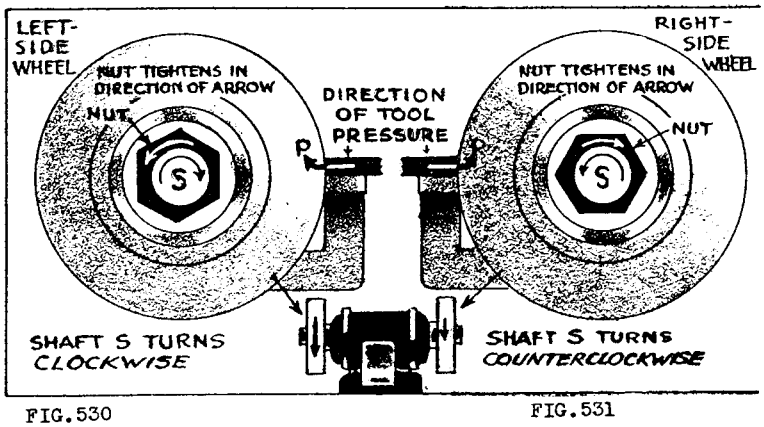


FIG.530 FIG.531

the shaft had a right-hand thread, the nut would loosen, and the wheel would slip on the shaft. The thread and the nut on the left-hand side of the grinder are always left-handed, thus causing the nut to tighten if the wheel should slip or turn slightly.

The wheels are encased in steel or semisteel guards (Fig. 527) as a protection against flying particles or larger pieces which might injure the operator if the wheel should break. An opening in the front of the guard is provided to allow the tool to be held against the wheel. The sides of the guards are hinged or detachable to allow the wheels to be mounted or removed from the spindle. The newer grinder guards are equipped with outlets to which an exhaust system is attached. The exhaust draws the grinder dust away from the wheel, thereby safeguarding the health of the operator and protecting other equipment. Exhaust systems which can be attached to individual pedestal grinders are now available from many of the leading manufacturers of grinding equipment.

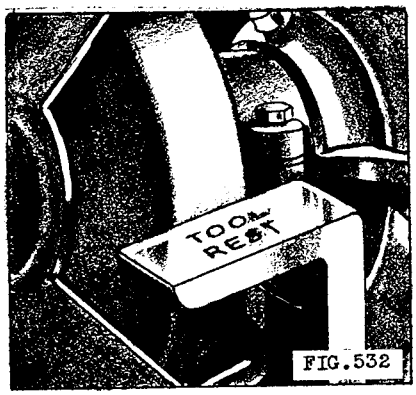


FIG.532

A tool rest (Fig. 532) is provided for each wheel so that tools may be steadied while they are being ground. Most tool rests are adjustable for height and may be moved in toward the spindle to compensate for the wear of the wheel.

The operator's eyes are protected against flying abrasive materials and ground metal by safety-glass eye shields (Fig. 527). Adjustable spark breakers (Fig. 527) which are attached to the upper portion of the guard, provide additional protection for the operator's eyes. They prevent particles from being carried around by the wheel and from rebounding from the tool rest. These also may be adjusted to compensate for the wear of the wheel.

A water pot is usually furnished on pedestal grinders so that the operator can plunge the tool into the water when it becomes heated by grinding. Safe, handy, and quick methods of starting and stopping the grinder are essential as safety factors. These requirements are best satisfied by providing the grinder with a push-button or toggle switch conveniently located near the hand of the operator.

DESCRIPTION of GRINDING WHEELS

The grinding wheel must be considered as an integral part of the bench and floor grinder. The development of the modern grinding wheel is the inevitable result of the demand for wheels which are uniform in quality and capable of grinding the harder metals and alloys which have been introduced during the last few decades.

This development was made possible by the discovery and use of artificial abrasives to replace the natural abrasives which previously had been used in wheel manufacture.

Natural abrasives, such as emery and corundum, are the products of the forces of nature. They are not uniform in character and contain a considerable percentage of impurities. These impurities impair the cutting qualities of the wheel. The artificial abrasives, on the other hand, are produced by subjecting certain minerals, such as bauxite, coke, etc., to intense electrical heat. This process yields a substance of uniform character and quality which, when crushed, produces a tough, hard, sharp abrasive grain.

Artificial abrasives are grouped under two general headings: aluminum oxide and silicon carbide. Those wheels that are made with an aluminum oxide abrasive are best suited for grinding hardened steels, high-speed steels, and other materials of high tensile strength; the silicon carbide wheels are used for grinding material of low tensile strength, such as cast iron, aluminum, etc.

The grain or grit of a wheel denotes the size of the particles of abrasive. The grain size is determined by the smallest size screen through which the grains will pass. For example, if a screen has sixty openings per linear inch, the grain number would be sixty.

The bond is the material used to bind the abrasive particles together in the form of a wheel. There are several types of bonding material, each having its own particular characteristics. One method of bonding, known as the vitrified process, is generally employed in the manufacture of wheels used on the bench and floor grinder. The bond, in this process, is a clay which, when fused or vitrified in a kiln, or oven, is converted into a glasslike substance which holds the abrasive grains securely together.

The grade of a grinding wheel is the degree of strength with which the particles of abrasives are held together. Wheels may be grouped in three general classifications: hard, medium, and soft. These terms do not refer to the degree of hardness of the abrasive itself, but to the holding power, or strength of the bond which holds the abrasive together. In other words, if the particles are easily dislodged from the face, the wheel is termed "soft"; in contrast, those wheels which hold the particles more securely are termed "hard."

Manufacturers designate the grade of grinding wheels by using letters or numbers, and sometimes a combination of both,to designate the grades. Unfortunately, there is, at present, no absolute grading system for grinding wheels. The alphabetical method of designating the grades is used by the majority of manufacturers for vitrified bonds, but, even then, some use the letters at the beginning of the alphabet to indicate wheels of the hardest grade, while

others use the beginning letters of the alphabet to designate wheels of the softest grade. The American Standard System of using the letters "S," "M," and "H" in combination with figures is expected, however, eventually to replace the alphabetical system.

The following is an example of two grading systems used by two leading manufacturers. The comparisons are approximate.

Hard Range	Medium Range	Soft Range
D E F G H	I J K L M N O	P R S T U V W
Z W U T S R Q	P O N M L K J	I H G F

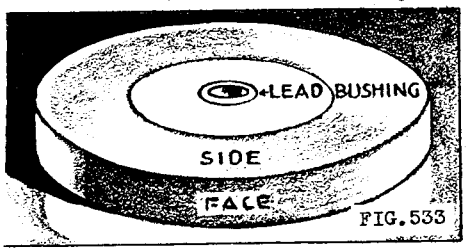


FIG. 533

The shape of the wheel used on the bench or floor grinder is the straight or disk wheel (Fig. 533). There are eight other standard shapes used in industrial grinding operations, but the disk wheel with straight sides is the one most commonly used when single-point tools are being ground.

Wheels recommended for bench or floor grinders are as follows:

Carborundum Company	Norton Company
Coarse-36-J-30 Aloxite (Vitrified) Range 24 to 40 Grit, H to K grade.	Roughing 36 O Alundum (Vitrified)
Fine-60-J-30 Aloxite (Vitrified) Range 50 to 80 Grit, J to M grade.	Finishing 60 N Alundum (Vitrified)

Wheels of similar grade made by other manufacturers can be selected from a comparative wheel-grade chart. These charts indicate the system of marking used by various manufacturers and give an approximate comparison of the wheel grades of one manufacturer with those of another.

When in doubt, however, regarding the selection of the wheel or its performance, write to the manufacturer. The data should include the speed of the wheel, its size and shape, the nature of the work, and the material to be ground. The manufacturer may be able to suggest some slight change either in the conditions under which the wheel is used or in the selection of the wheel itself, that will greatly increase the efficiency and the life of the wheel.

SELECTED REFERENCES

Abrasive Company — Grinding Wheel Data Book

Carborundum Company — Carborundum Grinding Bulletins

Norton Company — Lectures on Abrasives and Grinding