Safe Care and Restoration of Vintage Tools and Equipment

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Overview

Theatres in the 21st century are unique places in which techniques and practices of antiquity meet cutting-edge technology; often times the buildings themselves are decades or even centuries old. For example, The Theatre Royal Drury Lane, London's oldest West End theatre, was established in 1663, and rebuilt most recently in 1812 (LW Theatres). A more modern example, New York's Radio City Music Hall, opened in 1932 (MSG Entertainment). The former (as of this writing) is currently home to Disney's Frozen: The West-End Musical, while the latter is still the home of the famous Rockettes, and regularly hosts touring musicians and other acts. Given this dichotomy of old and new, it is likely that one would discover a myriad of technological "dinosaurs" within a venue when taking on a new technical role.

One might come into a theatre and find decades-old hydraulic systems controlling the rigging in a space, or walk into a scene shop and find a fifty-year-old table saw with a seized motor and a rusted table surface. Some scene shops may have no bench tools at all, requiring an appointment of new equipment with very limited budgets. This is a worst-case scenario, but it is important to be prepared for such a circumstance; they are rare, but not unheard of.

The purpose of this document is to provide an example of the kinds of machines one might expect to deal with in the scene shop of the average theatre, along with a catalog of steps one might take to refurbish old machines and tools to restore value and usefulness to what some theatre practitioners might see as useless antiques.

It is important to note that the tools in need of refurbishment in one shop would almost certainly be different from those in another shop. Furthermore, a tool made by one company or in a certain year might also be very different from the same tool produced by a different company, or in a different year. For this reason, it is incredibly difficult to create a complete guide to machine refurbishment. However, it is universally important to know certain things: how to clean machine parts, where to start when fixing an old tool, sourcing modern parts for old equipment, and how to identify an old, reliable tool beyond repair.

Why Restore Old Tools?

There are several reasons why one might wish to restore a vintage tool rather than purchase new ones. There are many people who feel that older tools are simply of a higher quality. “They just don’t make them like they used to.” While this is a sweeping generalization, there are merits to this opinion. Most power tools now are made with a variety of plastics, such as acrolonitrile butadiene styrene, polypropylene, or Nylon-66, among others. While these materials all have their own advantages (especially the fact that they are generally nonconductive), many feel that they lack the solid feeling of vintage tools.

These vintage tools were largely made with steel or aluminum bodies. While these remain vulnerable to harm, they would be likely to dent when a plastic-bodied tool might crack, rendering it unusable. It should be noted that many vintage tools were only equipped with a two-prong (ungrounded) power cable. This is because Underwriter’s Laboratories did not mandate grounded wiring on tools and appliances until 1969, and some tools continued to be produced without this safety feature into the 1970s (A New Ruling on Wiring). These tools along with their conductive metal shells can become an electrocution hazard because there is nothing preventing a short circuit through the body of the tool. Ultimately this is a hazard to the tool’s operator. The good news is that this is a deceptively easy safety feature to add: given the age of any tool missing a grounded plug, the old jacketing on the power cable would likely have dry-rotted anyway. One can replace the original power cord with a grounded one by attaching the ground wire to the metal body of the tool. This will safely dissipate electricity from such a short circuit. Because of the ease of this adaptation, a tool owner can use an older power tool with this added safety feature with relatively little work.

Beyond this idea of personal preference, there are external factors that might guide (or force) the manager of a shop to restore vintage tools rather than replacing them. For instance, when I took over as Production Manager and teacher of technical theatre at Midlothian High School, I found that my predecessor had collected some oddities. There were a few spade bits in the drawers of drill bits, but there was also a cabinet containing several working bit braces, and a whole collection of auger bits to go with them. The reasoning here was simple: this was a public school, beset with a student body well beyond its intended capacity, and classes were very full. It was difficult to keep an eye on so many students working on individual projects, and these hand-powered tools reduced risk to the students if I had to supervise one student group more closely than another. A bit brace is a much slower-moving tool than a power drill. It also offered a slower, larger tool with which the physics of drilling into wood could be demonstrated.

In the same setting, I was also beset with another external factor that keeps a shop manager from replacing every tool in their shop: expense. Because our shop lacked a table saw, one had to be purchased. After this large purchase, there were some shop funds left for drills and other necessities. I bought several, but I found myself pulling out and fixing the shop's old corded tools more often than not. This was often due to lack of budget. New tools are expensive, and always have been. The 1979 Craftsman Catalog lists their whole line of radial arm saws, which ranged from $169.95-$339.00. When adjusted for inflation, that totals $1,217.46-$2,428.46. A similar saw now sells for $5,604.88 from Original Saw. Analogous saws can be had for cheaper, such as the DeWalt DW722KN for $2,772.23. As these prices are

reflective of the time of writing, one could compare these to the average cost of rent in 2021: $1,328 for an 862 sq. ft. apartment in Richmond, VA.

While these prices are likely a pittance for government contractors or construction companies, theatres are usually operating on a much smaller budget so these prices can often be out of the question. It is probable that a manager would choose to attempt a restoration instead of replacement, especially if the scene shop in question has tools that might work if repaired.

How Tools are Used in the Scene Shop

There are distinct differences between how a carpenter in a scene shop uses a set of tools and how another tradesman might use those same tools. For example, a fine woodworker, cabinetmaker, luthier, or furniture maker would value different tools than a scene shop carpenter. In those disciplines, the artisan works in a methodical and exacting manner, taking relatively long periods of time to produce a piece of work of high finished quality. During this extra time, the maker would rely on a number of hand tools, such as planes, chisels, and card scrapers to achieve a fine finish on their delicate, expensive materials.

While many theatre carpenters can achieve high levels of finished quality, time is a constant enemy because there is simply not enough time in a typical build to reach those standards. For this reason, the most valued tools in a scene shop are ones that sacrifice detail and accuracy in exchange for value and speed.

Also, unlike a typical home contractor, a scenic carpenter is unlikely to bring their own tools to and from work every day. Assuming they are a shop employee and not a contractor moving from one theatre to another, carpenters are unlikely to ever travel with tools. Assuming one is working in a permanent shop space, there is no real limit to the size of tools with which a scene shop can be equipped.

There is an important reason for highlighting these facts: they give us information as to which tools are the most indispensable in the shop. If a scene shop had to operate for a time without a sharp set of chisels, it would be more reasonable than trying to operate without its only compound miter saw. These observations help determine which tools to restore instead of replacing. If the most frequently used tool in the shop is one that was restored in-house, that

might be fine, but as with any old machinery, additional downtime may be required for future maintenance. If it is reasonably within budget, the wiser option could be to buy such a tool new.

It is also relatively time-consuming to repair and maintain old tools. When selecting tools from the shop's existing stock to restore, it is a good idea to start with the one most expected to see frequent use. That way, the most important tools can be in operation while the less-frequently used tools take a lower priority.

Vintage Tools and Safety

In the late 1960s, Underwriter's Laboratories, a global safety certification company, began requiring grounded wiring on power tools and plliances. They were not alone in this. The United States was moving towards higher levels of safety regulation at the time, especially in the workplace. This is why the Occupational Safety and Health Act was signed into law in December 1970, calling for the establishment of the Occupational Safety and Health Administration in April of the following year (MacLaury). Given that many vintage tools may have been manufactured before the establishment of such a regulatory administration, it is important to acknowledge the history of workplace safety to establish the environment in which these tools were intended to be used.

It is difficult to compile early statistics and compare them to modern ones, as the mode of compilation has changed drastically. No statistics on workplace injuries were collected until 1910, when the Bureau of Labor Statistics began collecting this data from the iron and steel industries. This was expanded in 1925 to include twenty-four industries, and by 1952 this had been expanded to over 200 industries (Lerner 160-182).

The statistics were compiled as the "average number of disabling injuries per million man-hours worked." In manufacturing (excluding petroleum refining, smelting and refining of nonferrous metals, cement and lime manufacturing, and coke production), 1926 saw 24.2 of these injury data points (Lerner 160). This was the year the five-day, 40-hour work week was introduced, meaning that an average worker would contribute 2080 work-hours per year (or 97,760 hours in the average lifetime). Mathematically this means that, had nothing changed

and those numbers remained static, a worker in manufacturing in 1926 would have a little over a 10% chance of being critically injured at work at some point during their employment.

Of course this was not the case, as the statistics began to show drastic improvement. By 1956, despite the expansion of data collection, the rate of grievous injury per million work hours had decreased to 12.0 or less than half the rate from 1926 (Lerner 182). This pre-OSHA decrease in injury rate was due to several factors: Underwriter's Laboratories (UL) was established at the end of the 19th century for the purpose of independently testing the safety of building materials, later moving on to wiring, plastic materials, industrial control equipment, and life safety. The "UL mark" was being placed on products as early as 1906 (History UL). Companies were steadily coming under pressure despite there being no office able to enforce UL's standards. In that same span of time, membership in labor unions had reached an all-time high and work stoppages (strikes) among contract construction workers had tripled (Lerner 181-182).

Due to these factors, employers were always looking for ways to decrease lost worker-hours and the safety of tools used in the workplace factored into this. The National Saw Guard Company had been established in Indianapolis, IN in the late 1880s, and the use of their products and similar ones steadily increased through the 20th century.

The following figures show an illustration of the National Saw Guard Company's table saw guard, along with a modern guard.

Advertisement from "The Woodworker," Feb. 1898.

SawStop blade guard, photo courtesy of highlandwoodworking.com

The materials are different, and the modern SawStop guard has added side shielding, but the form factor of the two guards is surprisingly similar. During the early years of blade guarding for worker safety, these shields were not required. This means that finding a vintage

tool with a blade guard may be more challenging than finding one without, or a guard may have to be purchased separately.

By the time the handheld circular saw as invented in 1929, the necessity for a retractable guard on a handheld bladed tool was apparent, and even the earliest models of circular saw came with such a guard. However, these moving parts became a common place for tool manufacturers to save money, and as such, many would bind or fail, often leading the end user to remove it entirely. This creates the same challenge in finding a guarded tool.

Having established that vintage power tools can be variable in terms of safety features, it is necessary to look for what the minimum requirements are for hand and power tool safety. The following is compiled from OSHA safety standards. Note that the listed standards are nonsequential with focus on those most likely to be violated by improperly kept vintage tools:

- 1926.300(a): Condition of tools. All hand and power tools and similar equipment, whether furnished by the employer or the employee, shall be maintained in a safe condition.
- 1926.300(b): Guarding.
- 1926.300(b)(1): When power operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.
- 1926.300(b)(2): Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard. Guarding

shall meet the requirements as set forth in American National Standards Institute, B15.1-1953 (R1958), Safety Code for Mechanical Power-Transmission Apparatus.

- 1926.300(b)(3): "Types of guarding." One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are - barrier guards, two-hand tripping devices, electronic safety devices, etc.
- 1926.300(b)(4): "Point of operation guarding."
- 1926.300(b)(4)(i): Point of operation is the area on a machine where work is actually performed upon the material being processed.
- 1926.300(b)(4)(ii): The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.
- 1926.300(b)(4)(iv): The following are some of the machines which usually require point of operation guarding:
- 1926.300(b)(4)(iv)(a): Guillotine cutters.
- 1926.300(b)(4)(iv)(b): Shears.
- 1926.300(b)(4)(iv)(c): Alligator shears.
- 1926.300(b)(4)(iv)(d): Powered presses.
- 1926.300(b)(4)(iv)(e): Milling machines.

- 1926.300(b)(4)(iv)(f): Power saws.
- 1926.300(b)(4)(iv)(g): Jointers.
- 1926.300(b)(4)(iv)(h): Portable power tools.
- 1926.300(b)(4)(iv)(i): Forming rolls and calenders.
- 1926.300(b)(5): "Exposure of blades." When the periphery of the blades of a fan is less than 7 feet (2.128 m) above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than 1/2 inch (1.27 cm).
- 1926.300(b)(7): "Guarding of abrasive wheel machinery - exposure adjustment." Safety guards of the types described in paragraphs (b)(8) and (9) of this section, where the operator stands in front of the opening, shall be constructed so that the peripheral protecting member can be adjusted to the constantly decreasing diameter of the wheel. The maximum angular exposure above the horizontal plane of the wheel spindle as specified in paragraphs (b)(8) and (9) of this section shall never be exceeded, and the distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top shall never exceed 1/4 inch (0.635 cm).
- 1926.300(b)(8): Bench and floor stands. The angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as bench and floor stands should not exceed 90 deg. or one-fourth of the periphery. This exposure shall begin at a point not more than 65 deg. above the horizontal plane of the wheel spindle. Whenever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure shall not exceed 125 deg.

- 1926.300(b)(9): Cylindrical grinders. The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cylindrical grinding machines shall not exceed 180 deg.. This exposure shall begin at a point not more than 65 deg. above the horizontal plane of the wheel spindle. (See Figures I-11 and I-12 and paragraph (b)(7) of this section.)
- 1926.300(d): Switches.
- 1926.300(d)(1): All hand-held powered platen sanders, grinders with wheels 2-inch diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks one-fourth of an inch wide or less may be equipped with only a positive "on-off" control.
- 1926.300(d)(2): All hand-held powered drills, tappers, fastener drivers, horizontal, vertical, and angle grinders with wheels greater than 2 inches in diameter, disc sanders, belt sanders, reciprocating saws, saber saws, and other similar operating powered tools shall be equipped with a momentary contact "on-off" control and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.
- 1926.300(d)(3): All other hand-held powered tools, such as circular saws, chain saws, and percussion tools without positive accessory holding means, shall be equipped with a constant pressure switch that will shut off the power when the pressure is released.
- 1926.300(d)(4): The requirements of this paragraph shall become effective on July 15, 1972.
- 1926.301(a): Employers shall not issue or permit the use of unsafe hand tools.

- 1926.301(b): Wrenches, including adjustable, pipe, end, and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.
- 1926.301(c): Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads.
- 1926.301(d): The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.
- 1926.302(a)(1): Electric power operated tools shall either be of the approved double-insulated type or grounded in accordance with Subpart K of this part.
- 1926.302(b)(3): All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 p.s.i. pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.
- 1926.302(b)(8):Airless spray guns of the type which atomize paints and fluids at high pressures (1,000 pounds or more per square inch) shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.
- 1926.304(a): Disconnect switches. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off position.
- 1926.304(d): Guarding. All portable, power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth,

except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

- 1926.304(g): "Radial saws."
- 1926.304(g)(1): The upper hood shall completely enclose the upper portion of the blade down to a point that will include the end of the saw arbor. The upper hood shall be constructed in such a manner and of such material that it will protect the operator from flying splinters, broken saw teeth, etc., and will defect sawdust away from the operator. The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of the stock and remain in contact with stock being cut to give maximum protection possible for the operation being performed.
- 1926.304(h):"Hand-fed crosscut table saws."
- 1926.304(h)(1): Each circular crosscut table saw shall be guarded by a hood which shall meet all the requirements of paragraph (i)(1) of this section for hoods for circular ripsaws.

Some of these standards, such as 1926.301(a) and 1926.301(a) may seem a bit vague while those such as 1926.300(b)(1) (When power operated tools are designed to accommodate guards, they shall be equipped with such guards when in use) will likely be cited by some as a grandfather clause allowing the use of old power tools without proper guarding. Those tools may have been designed without guards. The surrounding standards, however, go into more intricate detail as to specific requirements for tool guarding, and those standards supersede that excuse for using unsafe equipment. The American National Standards Institute (ANSI) standard listed in OSHA 1926.300(b)(2) goes into extraordinary detail about guarding requirements. It provides an excellent resource for making sure vintage power tools are properly equipped for use in the modern shop.

Though this may be a large quantity of information to keep in mind throughout the process of refurbishing old equipment, those standards are always there for reference. They come down to a few simple points: first, equipment produced before the mid-1970s may or may not have everything they need to be considered safe by today's standards. Second, vintage tools and equipment may work very well for their required application because they usually can be brought up to current standards. Finally, there is a dearth of information available through OSHA and ANSI to help guide the restoration of this equipment.

Example Tool Restoration

To explore the potential difficulties of tool restoration, the best way to begin is to restore a tool in need of care. We started with a bench grinder; This tool is from 1997 and is not as old as some of the examples explored in earlier sections of this document. Despite its relatively new age, it is more than old enough for the tool to have received abuse. The tool is shown in Fig. 1-1, 1-2, 1-3, and 1-4.

Fig. 1-1

Fig. 1-2

Fig. 1-3

Fig. 1-4


BENCH GRINDER
MODEL NO. B-6
H.P. 1/2
VOLTS 115V
PHASE 1
CYCLES 60Hz
RPM 3400
DATE 1997
THE SHORT TIME
OPERATION 25min
SERIAL NO
MADE IN CHINA

There were a few problems here which were immediately obvious- if we look to the OSHA standards for abrasive wheels, we find the following:

1926.303(c)(1): Floor stand and bench mounted abrasive wheels, used for external grinding, shall be provided with safety guards (protection hoods). The maximum angular exposure of the grinding wheel periphery and sides shall be not more than 90 deg, except that when work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 125 deg. In either case, the exposure shall begin not more than 65 deg. above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the effect of a bursting wheel.

1926.303(c)(2): Floor and bench-mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept at a distance not to exceed one-eighth inch from the surface of the wheel.

1926.303(e): "Work rests." On offhand grinding machines, work rests shall be used to support the work. They shall be of rigid construction and designed to be adjustable to compensate for wheel wear. Work rests shall be kept adjusted closely to the wheel with a maximum opening of 1/8 inch (0.3175 cm) to prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage. The work rest shall be securely clamped after each adjustment. The adjustment shall not be made with the wheel in motion.

This particular bench grinder has no protective hoods and work rest. It was likely used in someone's home, where the rules and regulations of OSHA do not apply. Once we bring the tool into the shop, we must correct these failings for reasons of both safety and legality.

Furthermore, the shaft of the tool had quite a bit of grime and rust built up. While unlikely to become a hazard, this buildup could compromise the operation of the tool if it was allowed to go unchecked (see Fig. 2-1, 2-2).

Fig. 2-1

Fig. 2-2

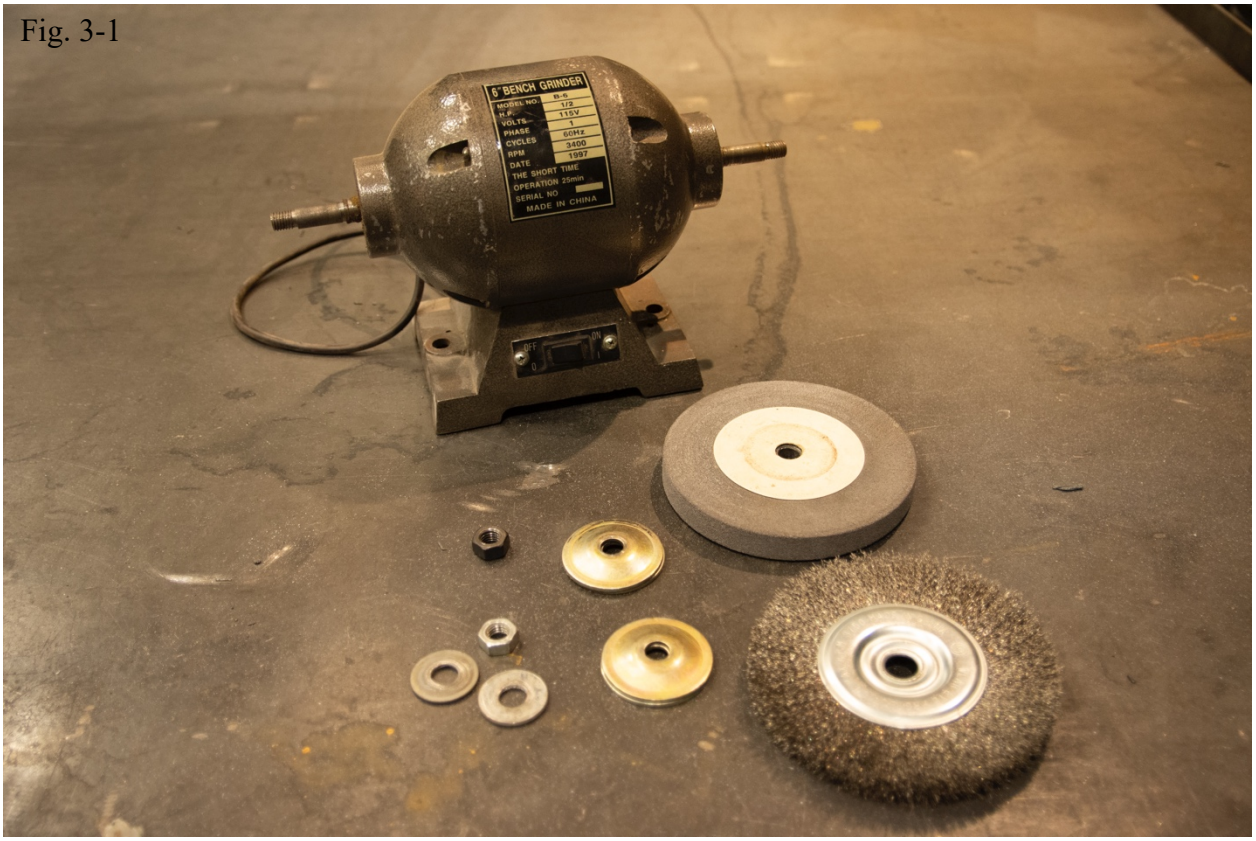
The first step was testing to see that the motor itself was functional and it was not seized or damaged. After testing the tool, it became apparent that it had some major issues with its balance which resulted in extreme vibration while in operation. This needed to be fixed because it could result in damage to the tool or unsafe operation.

I began by trying to level the wheel using a diamond grinder wheel dresser. The wheel was shaped and flattened, but this yielded no result in correcting the vibration issue. I then stripped the tool down to its bare shafts (Fig 3-1) and discovered the likely cause: the tool's previous owner had outfitted is grinder with a wire wheel intended for a different size shaft. This overly-large arbor hole had allowed the wire wheel to slip out of concentricity with the

tool's shaft resulting in oscillation of +/- 3/16" (4.76mm). Though this may not sound like much, it could be the cause of the huge vibrations in the tool.

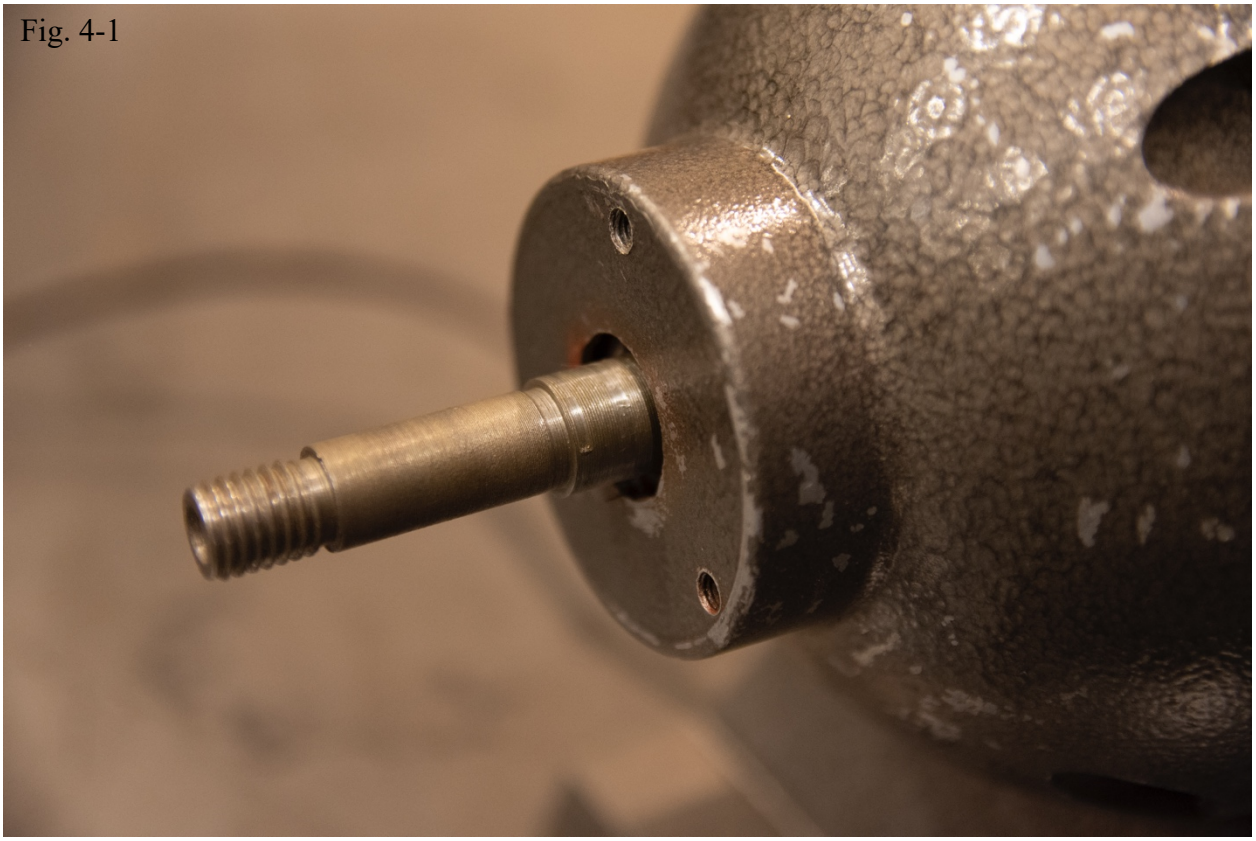
With the wire wheel removed from the tool, I turned it on again to find that the vibration was gone.

Fig. 3-1



After the vibration was corrected it was time to clean the grime off of the tool's shaft. I did this with a steel brush. (Fig. 4-1). I then gave the tool a general cleaning with an abrasive pad and degreaser. I was also able to clean out the tool's casing thoroughly with a pneumatic nozzle.

Fig. 4-1



My next step was to get a few key measurements of the tool to source or build the necessary guards. I already knew that the wheel diameter the tool accepts is 6 inches (also sold as 152mm wheels). Next, I needed to measure the diameter of the casing's side faces and the length of the exposed shaft (Figs. 5-1, 5-2).

Fig. 5-1

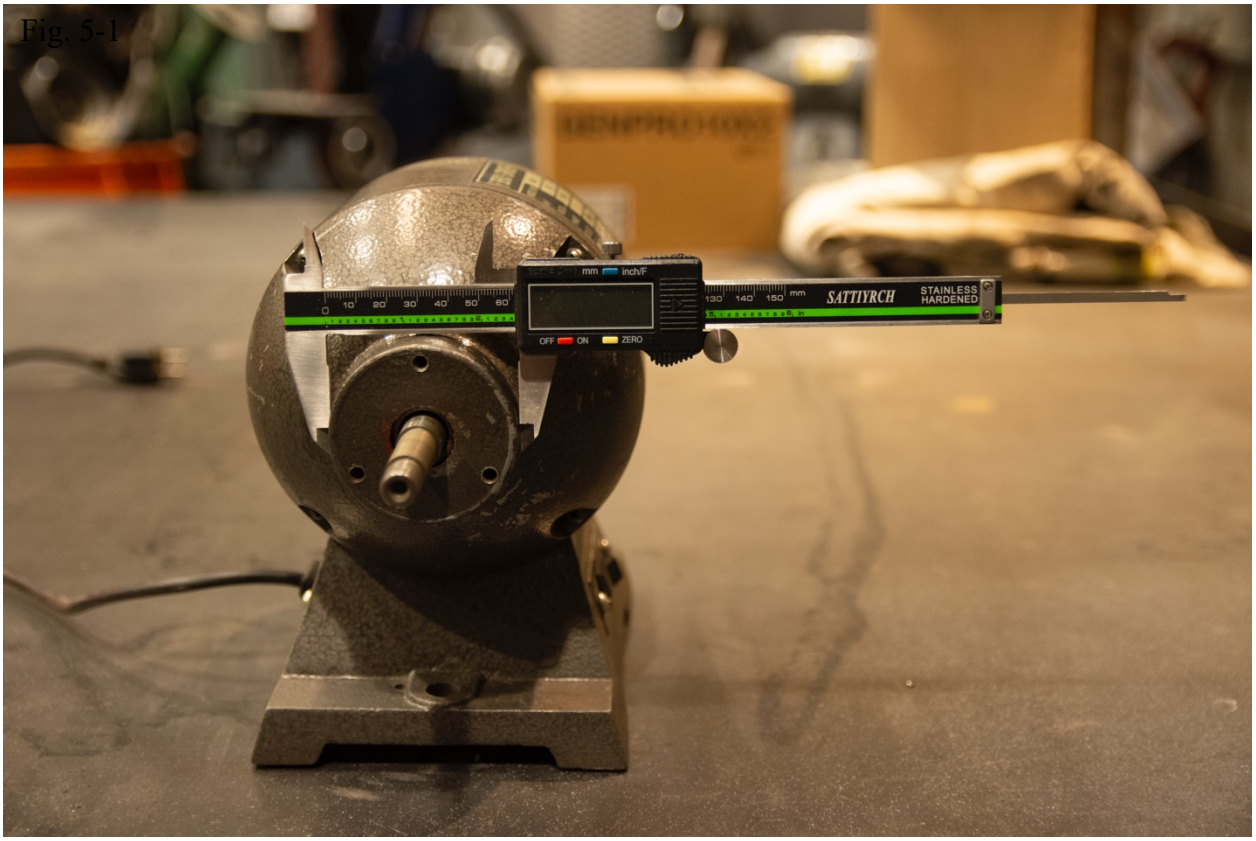


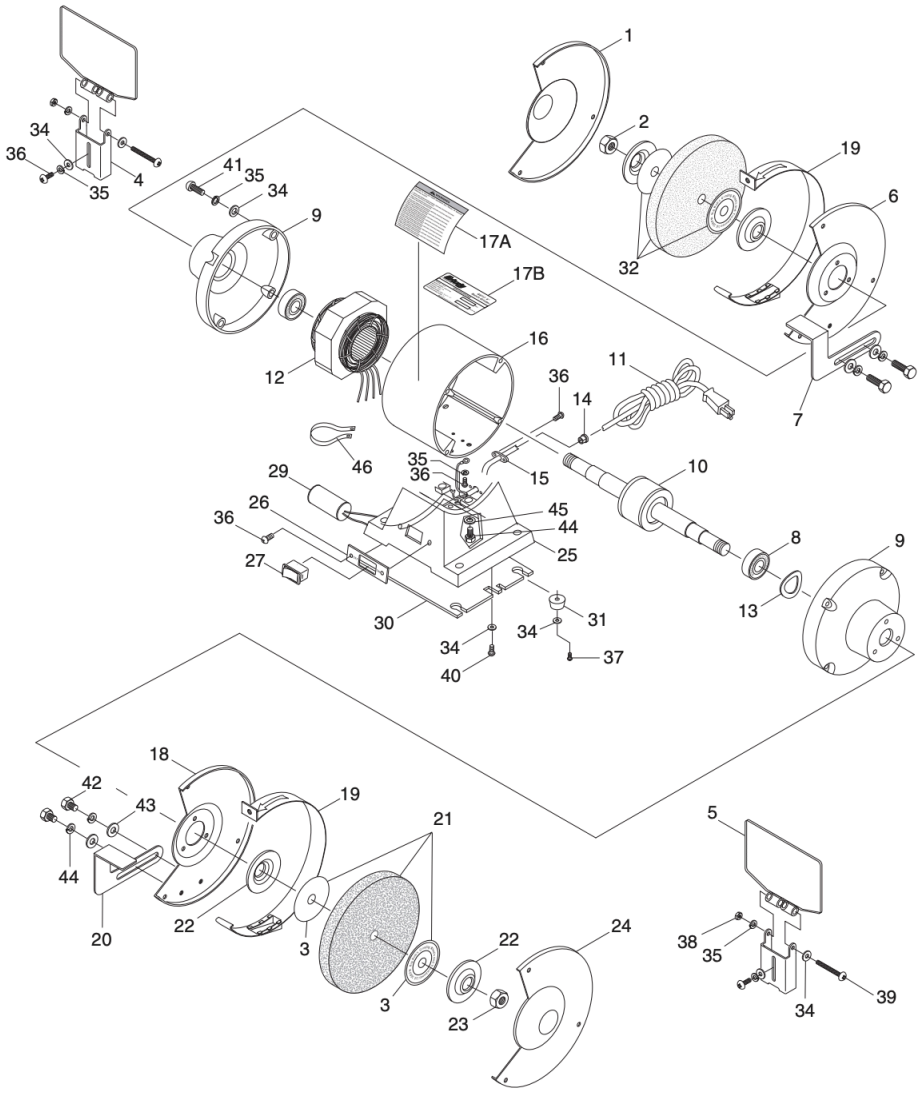
Fig. 5-2

These measurements came out to 62mm and 52mm, respectively. In addition to the guarding and work rest issues, the grinder's power cable had at some point been purposefully un-grounded by means of physical removal of its ground pin (Fig 6-1). The purpose for doing this would be to make a grounded cable (3-prong) fit into an ungrounded (2-prong) outlet or extension cord. This is very dangerous. It also goes against the standards and regulations set forth for shop equipment.

Fig. 6-1

Now that our tool had been cleaned and assessed, it was time to get to work on repairing these issues.

My first step was to see what I could source. This means looking for similar modern tools or companies that produce guards for vintage tools. I was able to order a bench grinder from Grizzly Industrial, Inc. that had a similar footprint and body style. If these parts proved to be an imperfect fit, they could be safely modified to work.



G9717 parts diagram from Grizzly Industrial

On this parts diagram, the items I needed are numbered as follows: 18, 19, 24, 20 (right side), and 1, 19, 6, and 7 (left side). The parts for the left side were not in stock and were no longer being produced, but this still suits my needs for this tool. The work rests also could not be ordered, so this would become a tool for which I would both purchase and fabricate parts.

Once the guard for the right side of the tool was installed, I fabricated a work rest for that side from angle iron and plate steel. I also fabricated the upper guard,

commonly known as a “spark arrest.” I fabricated these parts making sure to add necessary slots allowing for the required adjustability. OSHA requires that the work rest and spark arrest be able to adjust to remain no further than 1/8 inch from the grinding wheel as the wheel wears down.

My intention was to install a buffing wheel on the left side rather than a second grinding wheel. These wheels are made from a sewn cotton material and are used to polish surfaces. They require none of the guarding of a grinding wheel because they lack the harsh abrasiveness and do not remove material at the same rate. The following is an excerpt of a letter from John B. Miles, Director of Compliance Programs at OSHA, sent to the Law Offices of Paul, Hastings, Janofsky & Walker LLP:

“Abrasive wheels must be guarded in accordance with 29 CFR 1910.215. Section 1910.215 addresses the hazards of coming in contact with a rotating abrasive wheel and of being struck by abrasive wheel fragments. An abrasive wheel is defined in 1910.211(b)(14) as a cutting tool consisting of abrasive grains held together by organic or inorganic bonds… Abrasive grinding wheels have high densities (greater than 2.0 g/ml), have low percent voids (less than 25 percent), and are very hard.

In contrast, buffing and polishing wheels have low densities (less than 1.0 g/ml), high percent voids (greater than 40 percent), and are soft. These products are light, soft, and relatively flexible… surface conditioning wheels are not abrasive wheels and are polishing and buffing wheels. Therefore the guarding requirements of 1910.215 do not apply…” (Miles)

Since I wanted a buffing wheel anyway, being unable to order the guards for the left side was inconsequential.

With all the proper guards in place, I replaced the tool's power cable with a new one that was both grounded and properly shielded. My results yielded a 2022 ANSI and OSHA compliant working bench grinder seen in figs. 7-1 through 7-4.

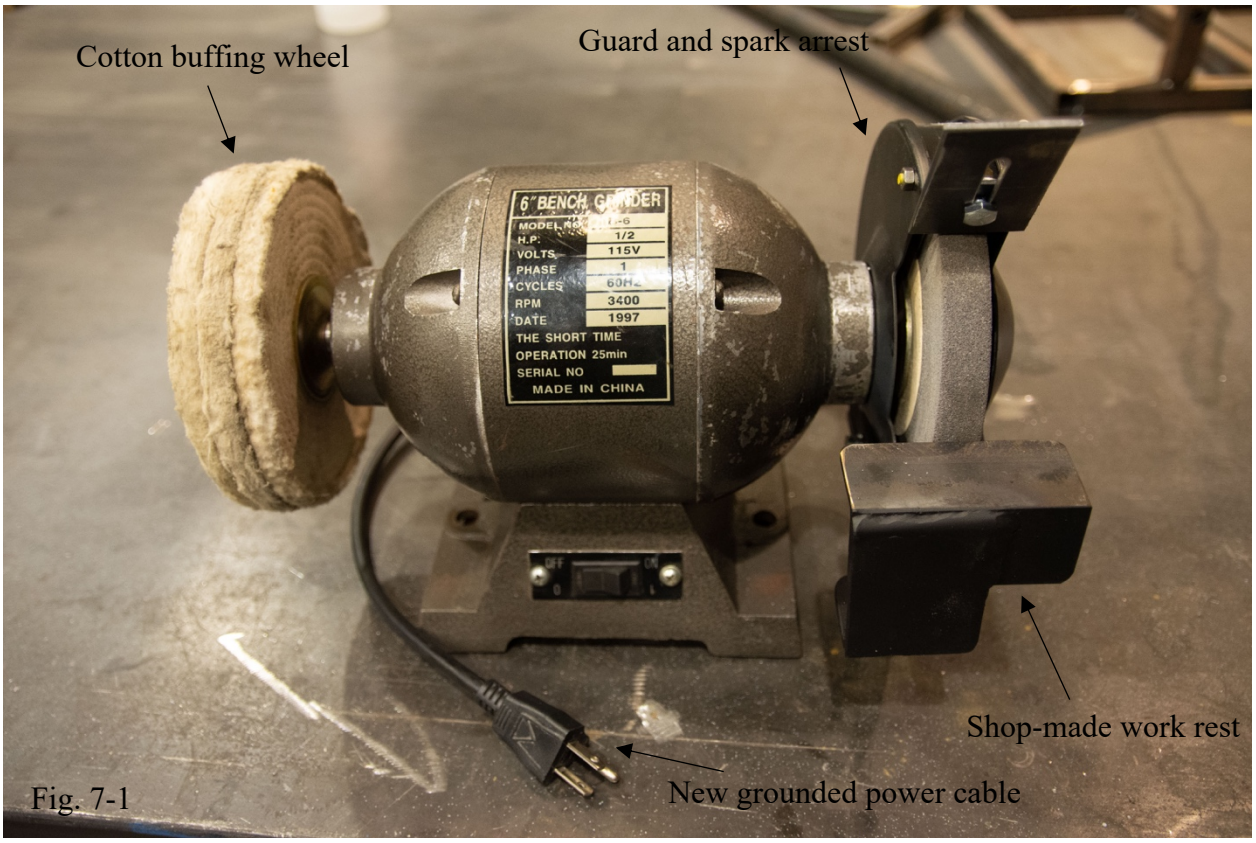


Fig. 7-1

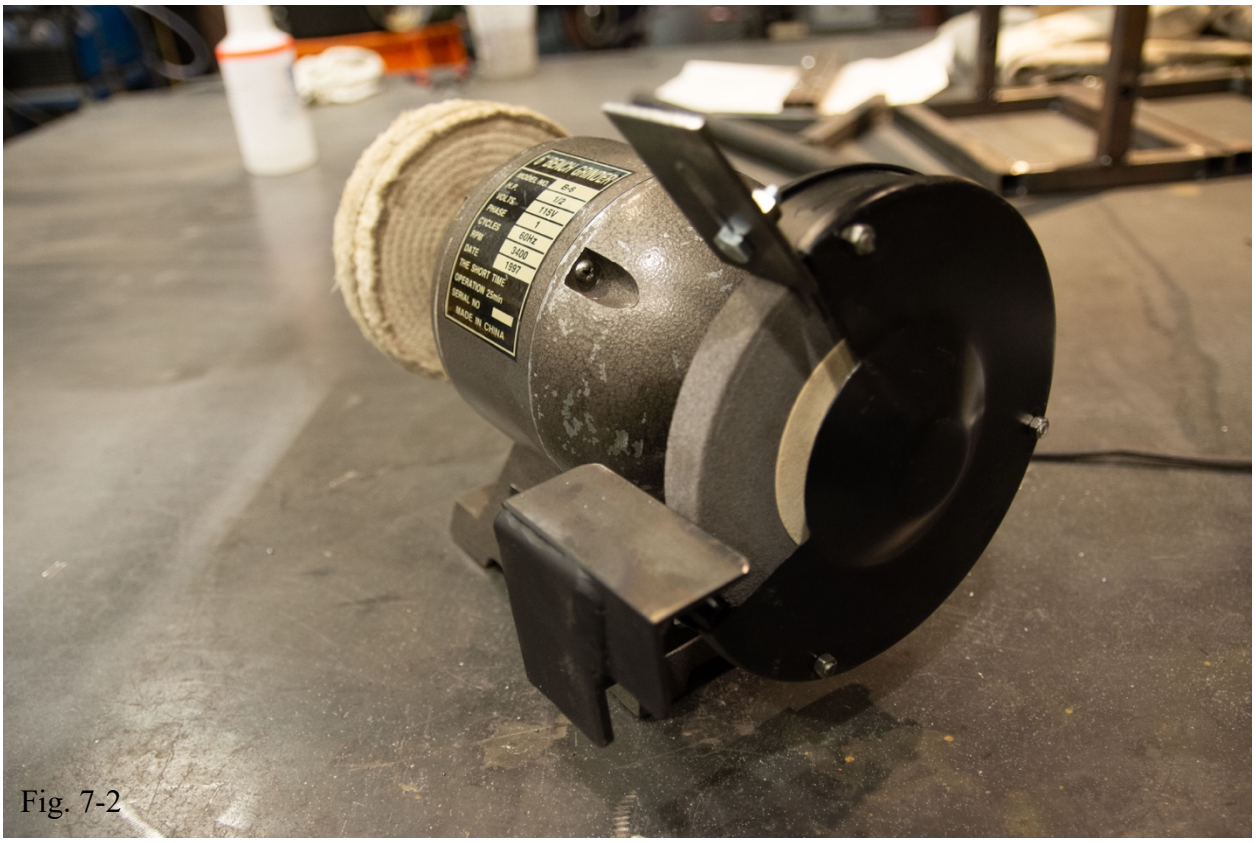

6" BENCH GRINDER
MODEL NO. B-6
H.P. 1/2
VOLTS 115V
PHASE 1
CYCLES 60HZ
RPM 3400
DATE 1997
THE SHORT TIME OPERATION 25min
SERIAL NO
MADE IN CHINA

Fig. 7-2

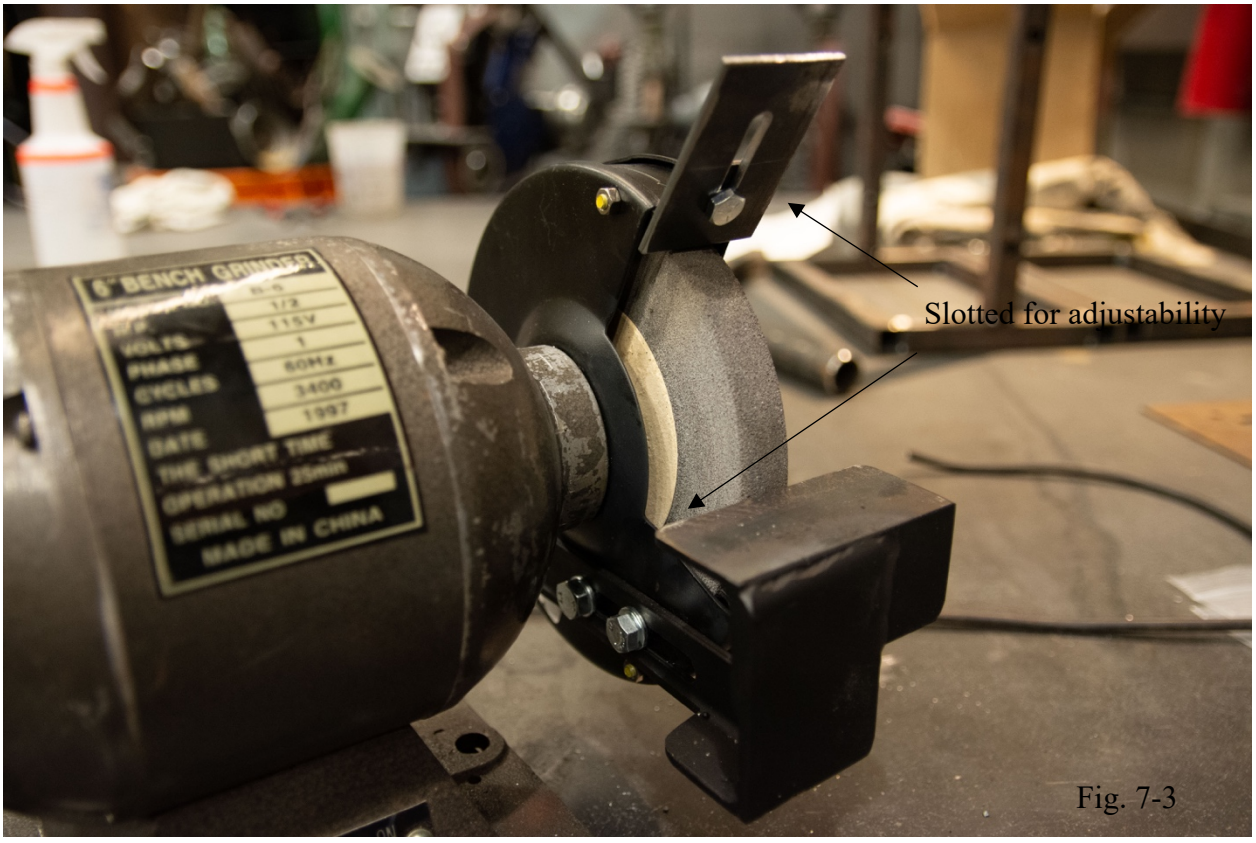

6" BENCH GRINDER
B-6
1/2
115V
1
60Hz
3400
1997
THE SHORT TIME
OPERATION 25min
SERIAL NO
MADE IN CHINA
Slotted for adjustability

Fig. 7-3

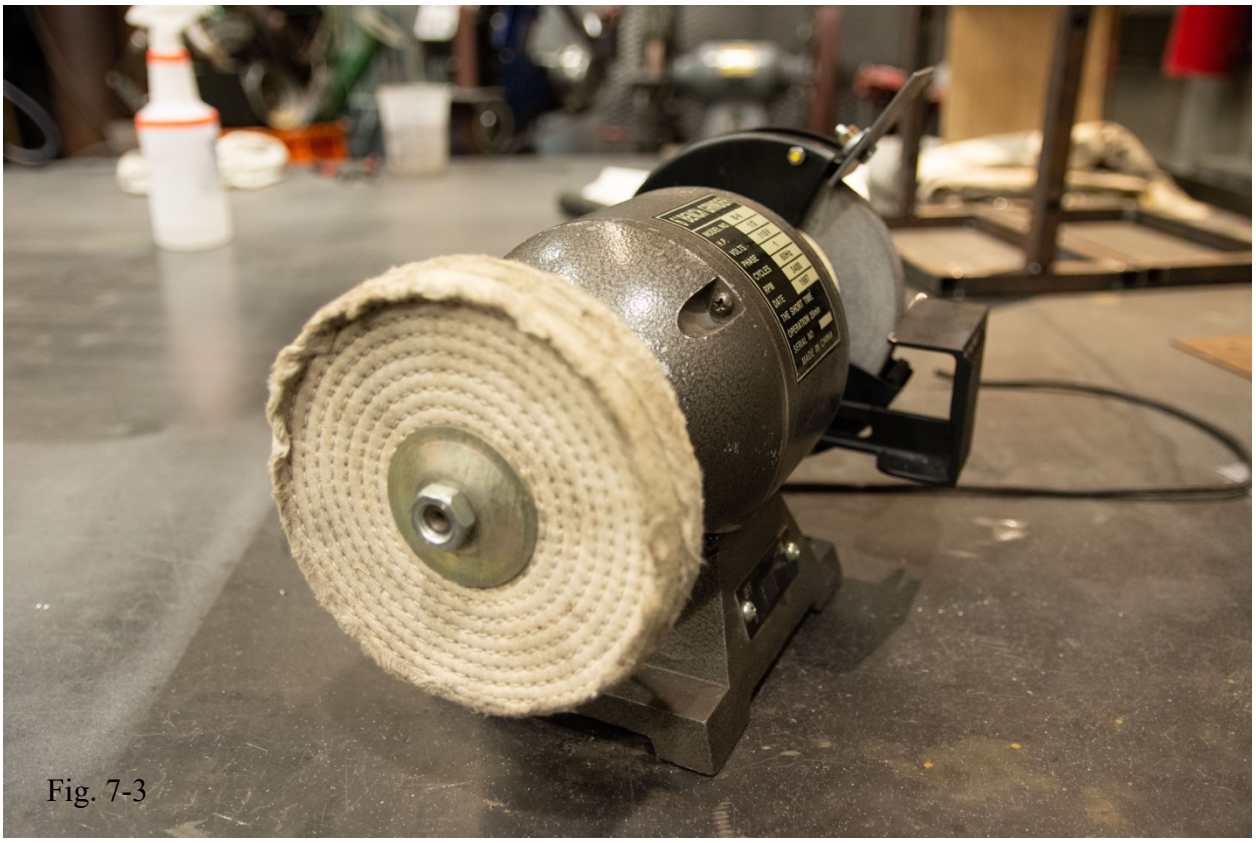


Fig. 7-3

Conclusion

As established in this document's Overview section, this is not a complete guide to machine repair. However, it is my hope that it can show interested parties where one might look to find pertinent information to repair a piece of old equipment and make it something that one could use legally and safely in a modern shop.

Tools and their best practices have evolved rapidly. It is clear that over the last 110 years the rate of debilitating injuries has drastically decreased, despite rough census numbers and inconsistent polling. This is due to worker demands and increased government regulations and requirements. Though ANSI requirements and OSHA enforcement serve to make workplaces safer, they do not provide guidelines for home use. Therefore, home use standards are lacking. Some home users may consider the fact the tool powers up as a safety standard. For the working shop though, these standards must be consulted before a tool or piece of machinery is considered restored and ready for use.

The most vital piece of information for anyone running a shop workplace to know is how to access this information and how to read it. Since all tools are different, beginning and advanced shop managers need to consult numerous documents and video to gather the necessary knowledge to repair the inner workings of a tool. However, this information will always be in one place.

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