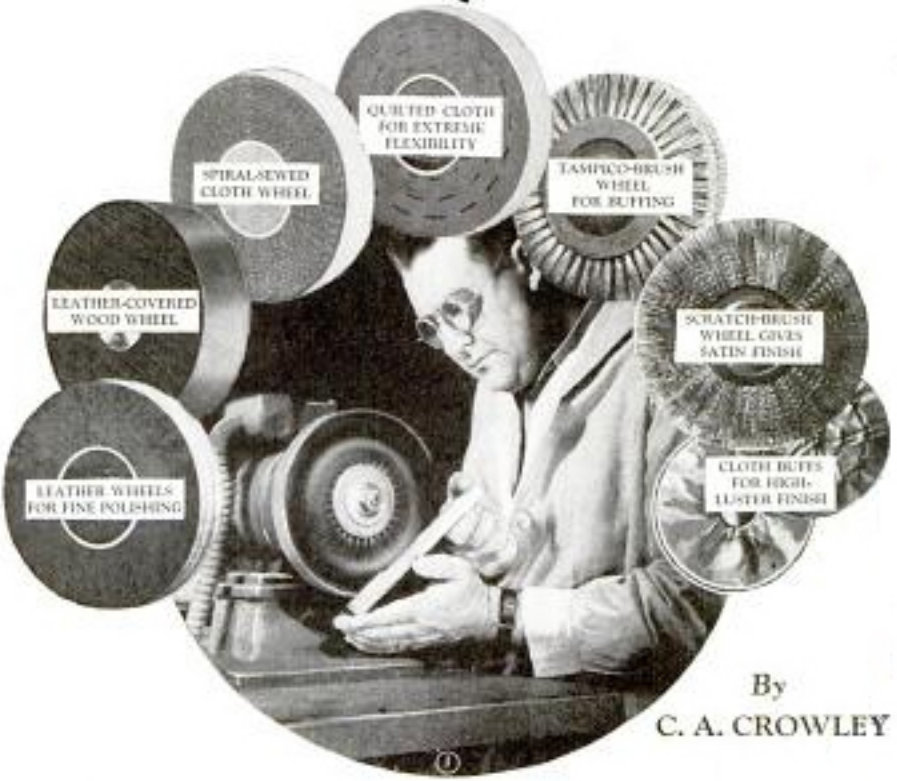
To BUFF and To POLISH

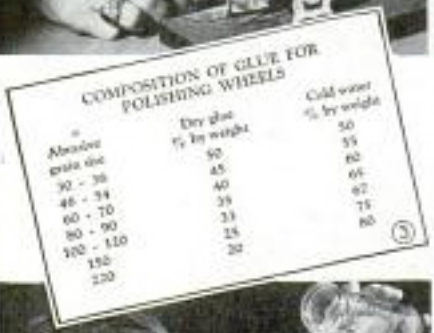


By
C. A. CROWLEY

PRODUCING a high-luster finish on a metal surface divides itself into three distinct processes; grinding, polishing proper, and buffing. Grinding with an emery wheel leaves a multitude of fine scratches on the surface. Polishing simply removes these finer marks by grinding away small amounts of metal. Where a very fine finish is desired, the polishing operations are followed by buffing with a soft wheel and very fine abrasives. This removes even the fine marks left by the polishing abrasives and leaves a surface which is glass smooth.

Polishing and buffing are similar processes, the only difference being that in polishing the abrasive is glued permanently to the wheel, while in buffing the abrasive is fed to the wheel during the operation. Polishing abrasives usually are identified by number, from No. 120 to No. 220, while buffing abrasives are numbered above 220. Polishing wheels, Fig. 1, are made from a number of materials. Wood faced with leather, sheepskin, bull neck and walrus leather, canvas, felt, muslin, and flannel are materials commonly used. Leather-faced wooden wheels are, of course, rigid, and are suitable only for polishing flat work. For curved surfaces wheels faced with the more flexible materials are used. Soft buffs are made of disks of cloth or sheepskin loosely sewed together.

On polishing wheels such artificial grits as aluminum oxide, silicon carbide and natural emery are most generally used. For buffing, a number of natural abrasives are used, these being in the form of a cake made of the abrasive and grease or tallow so that the grit may be applied to the buf-



COMPOSITION OF GLUE FOR POLISHING WHEELS

Abrasive grain size	Dry glue % by weight	Cold water % by weight
30 - 36	50	50
46 - 54	45	55
60 - 70	40	60
80 - 90	35	65
100 - 110	33	67
150	25	75
220	20	80

fing wheel by friction, as shown in Fig. 8. The ordinary buffing compounds, in descending order of hardness and sharpness, are emery, tripoli, pumice, crocus, lime and rouge.

Animal-hide glue in the ground form is generally used for applying abrasives to polishing wheels. It should be mixed with water by weight as shown in Figs. 2 and 3. The water must be measured accurately as in Fig. 4 on the basis of 1 oz. avoirdupois equals 1 fluid oz. The glue should soak in cold water for one hour. After soaking, the glue solution is carefully heated to a temperature of 140° F., in either a water-jacketed gluepot or one electrically heated as in Fig. 5. Once the glue is melted, it should be applied quickly to the wheel with a brush, Fig. 6. It's a good idea to have the wheel heated to the same temperature to avoid chilling and jelling of the glue. The glue-coated wheel is then rolled through a sheet-metal trough containing the abrasive until it is thoroughly and evenly coated, as shown in Fig. 7. Let it dry for 24 hours. A new wheel should always be given a thin sizing coat of glue followed with two coats of abrasive. If an old wheel is to be recoated, first true it up with a silicon-carbide stick and then treat it as a new wheel.

Abrasives used in buffing have special characteristics, each one being suited to its own particular uses. Emery cake comes in a great variety of degrees of fineness. It is frequently used as a preliminary buffing compound for "cutting down" the last fine scratches left by polishing. It should not be used on stainless steels, however, as it contains iron. Tripoli is composed of soft, porous grains without sharp, hard surfaces. It produces a very high polish on soft metals such as brass and aluminum. Crocus is sometimes used for a high finish on iron or steel. Vienna lime or venetian lime is extensively used in polishing nickel-plate while rouge is one of the softest buffing compounds and is used for the finest finish. Chromium oxide or "green rouge" is used for the final finishes on stainless steel, Monel metal and nickel. Fig. 12 gives suggested motor sizes for operating wheels of various diameters. Although not essential, it is better to have the wheel run clockwise as viewed from the operator's left, as this makes it handier to hold the larger work.

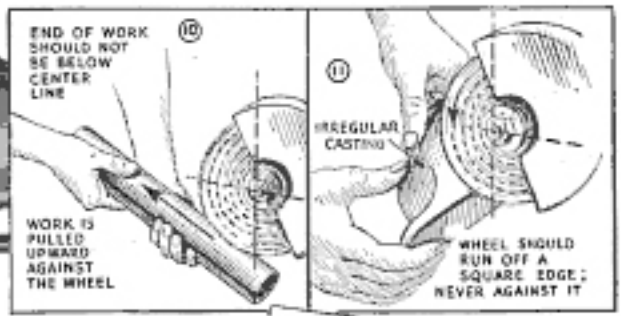
In any case the wheel should run toward the operator so that the work can be held against the wheel at a point below the horizontal center line as in Fig. 10.

Both polishing and buffing wheels are operated at speeds varying from 2,500 to 7,500 surface feet per minute, and sometimes higher, the most general practice being operation at 3,000 to 6,000 s.f.m. Fig. 13 shows you how to translate surface feet per minute to revolutions per minute for various wheel sizes. To use the chart, find the diameter of the wheel on the bottom of the graph, then follow the vertical line corresponding to this diameter up to the curve marked with the desired surface speed and from this point read straight across to the left-hand margin where the r.p.m. can be found. Should you require a surface speed not shown, for example, if a speed of 3,500 s.f.m. is desired, the r.p.m. can be found by averaging the next smaller and the next larger values. These wheel speeds are only approximate and there is no necessity for adjusting them closer than within 100 or 200 s.f.m.

Now the sequence of operations followed in polishing and buffing any metal article must be determined by the condition of the work, the final finish desired, and the metal of which the article is made. Soft metals may need fewer operations than harder metals. A rough casting will require more polishing than a sheet of metal that is already quite smooth. If a mirror finish is desired, operations must be continued down to the softest buffing materials; if a duller surface is satisfactory, perhaps no buffing operations at all will be needed. The skill of the operator also has much to do with the final result. Naturally a skillful workman will produce a given finish with fewer operations than a less experienced man. Hence, the following suggestions are only general. In certain cases wheel speeds have been suggested; where they have not, a speed of 5,000 to 6,000 s.f.m. will be satisfactory. For polishing steel, use first a No. 120 abrasive on a dry-rag wheel, followed with a No. 150 on a greased-rag wheel, and finally with No. 180 on a greased-rag or sheepskin wheel. The article can then be buffed with No. 180 emery cake or paste on a Tampico brush wheel. Rough steel castings or forgings can be given a preliminary rough polishing

off and the article is plated. Castings may be buffed also with tripoli and lime.

Aluminum is very soft, and hence it is desirable to lubricate all the finer polishing wheels used on aluminum to prevent tearing of the metal. All wheels finer than No. 120 used on aluminum should be greased. The wheel is greased by applying a tallow stick or cake to its surface while it is running. Kerosene is sometimes used as a lubricant. Aluminum articles should be pol-

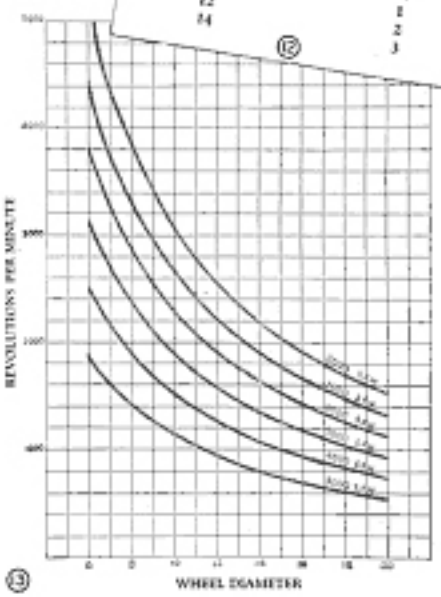


with a No. 60 polishing wheel. This gives a final finish which is suitable for plating. Generally synthetic aluminum-oxide grits are used for the polishing and the first buffing operations on stainless steel. Tripoli may also be used for buffing, and the highest luster developed with chromium-oxide or green rouge. A suggested sequence of operations would be polishing with No. 90 and No. 120 artificial alumina on dry-rag polishing wheels, a final polish with No. 180 on a greased polishing wheel, and buffing with tripoli. For a mirror finish, the article is buffed again with very fine aluminum-oxide buffing compound, and finally with green rouge. For a satin finish the final operation is brushing with pumice on a Tampico brush.

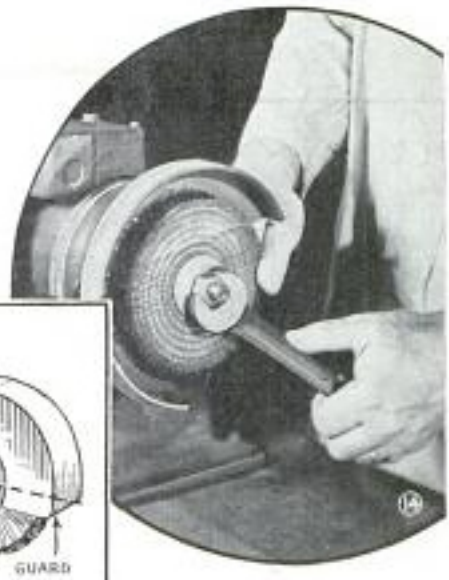
Brass, being softer, will usually require fewer polishing and buffing operations. Castings can be polished with No. 80 and No. 120 and finally with No. 180 on a greased wheel, and then buffed with an emery-grease compound. Stampings can be polished similarly at 5,500 or 6,000 s.f.m. and then buffed on a loose muslin buff at a slower speed, such as 4,000 s.f.m. Buffing may be done with fine tripoli. For nickel-plating there should be a final buffing with lime on a muslin or linen wheel, after which the buffing compounds are cleaned

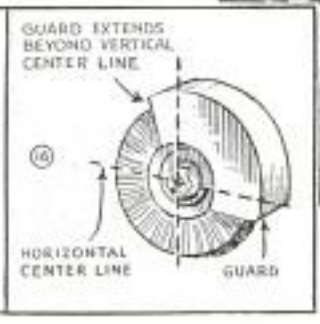
MOTOR SIZES FOR POLISHING AND BUFFING

Diameter of wheels inches	Horsepower required
6	¼
10	½
12	1
14	2
	3



ished at 5,500 s.f.m. using Nos. 80, 120 and 180 grits on the wheels. The No. 80 wheel may be used dry. Then the work is buffed with tripoli and lime on a muslin buff, and finally with rouge. The buffing operations can be carried out at a somewhat higher speed, 7,000–7,500 s.f.m. Scratch-brushing at low speeds, 600 r.p.m. with a 6-in. brush, produces a dull gray finish. A satin finish can be produced by brushing with fine alumina on a Tampico brush at 3,000 s.f.m. A similar finish can be produced on brass or steel with pumice and water at 3,000 s.f.m.





Zinc die castings can be polished with No. 120 grits then buffed with tripoli, and finally buffed at 6,000 s.f.m. with a soft buffing compound. As an alternative final operation, zinc articles can be brushed with fine pumice and water on a Tampico brush at a low speed. Zinc-plated surfaces can be buffed with tripoli and lime. Nickel and copper-plated surfaces should be buffed with lime on a soft wheel, and then with rouge. A nickel surface which is to be chromium-plated requires careful buffing, as the final finish will show up any marks left after buffing. Monel metal can be buffed with fine emery cake, then tripoli, then with lime or chromium-oxide rouge.

Where buffing and polishing is done with a small bench grinder, such as that shown in Figs. 9 and 14, some precaution must be taken to assure safety as well as good work. First see that the guard is set properly to clear the work, Figs. 9 and 16. Then make sure that the wheel is tight on the shaft and that it runs true, Fig. 14. Some grinders of this type may require an extra washer to hold cloth buffing wheels. Figs. 11 and 15 show two things to avoid in any polishing or buffing operation. In either case should the wheel run against a square edge or into a vee in the casting or other object, the work is likely to be thrown from the hands with dangerous force.

Parking-Garage Charts Give Customers Lubrication Data

For the convenience of his customers, one owner of a parking garage has a blackboard hung on the wall at each parking stall showing the customer's name, stall number and the mileage at which the car should be greased and the oil changed. The garageman claims that his customers appreciate this service and they give him most of their lubrication jobs.

—Opie Read, Jr., Chicago.