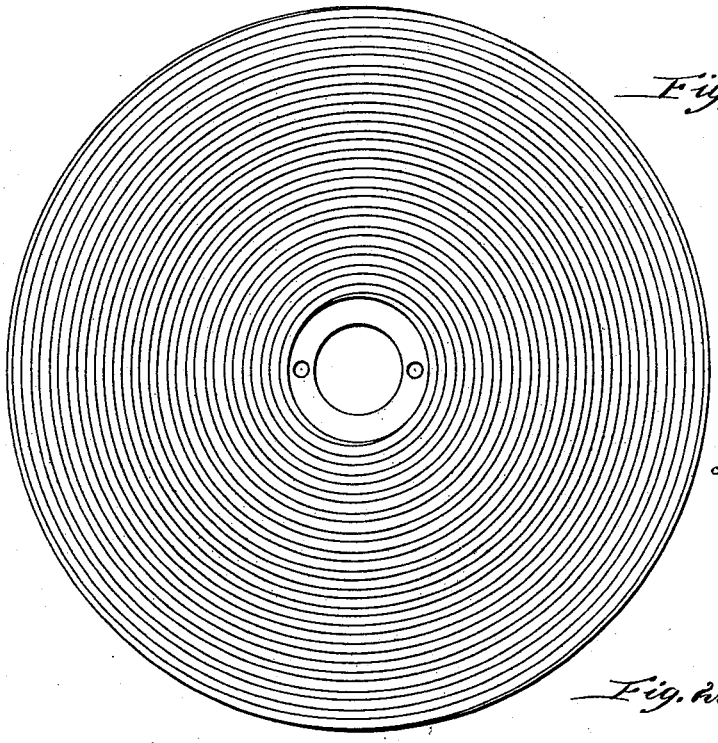
(No Model.) 3 Sheets—Sheet 1.

F. N. GARDNER.

GRINDING AND POLISHING WHEEL AND ART OF MANUFACTURING SAME.

No. 494,472. Patented Mar. 28, 1893.

Fig. 1.

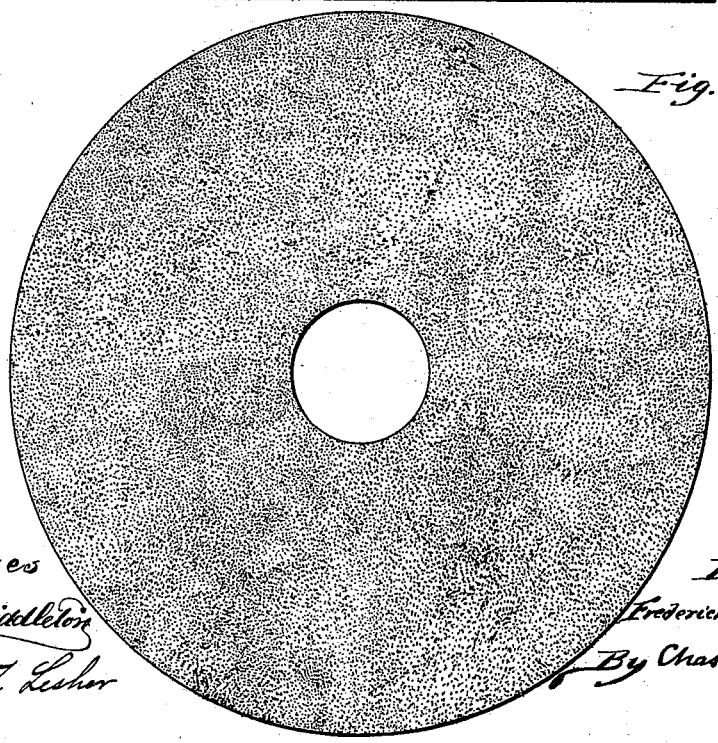


A

Fig. 2.

A

Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

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GRINDING AND POLISHING WHEEL AND ART OF MANUFACTURING SAME.

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Fig. 4.

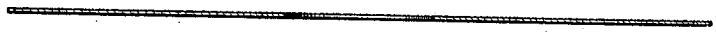


Fig. 5.

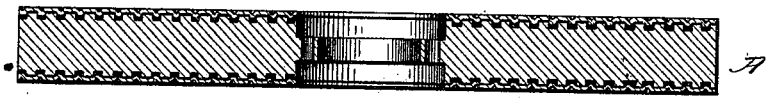


Fig. 6.

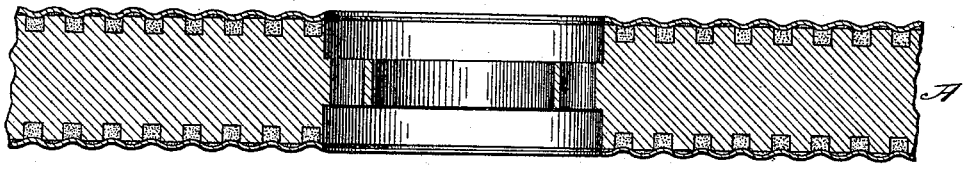


Fig. 7.

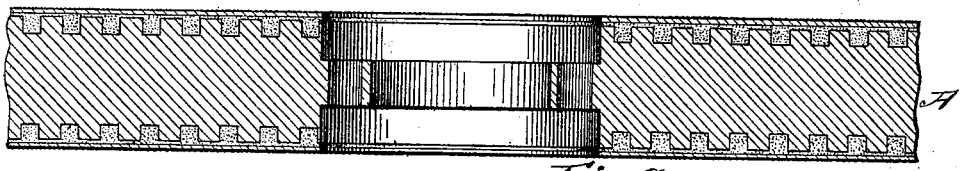


Fig. 8.

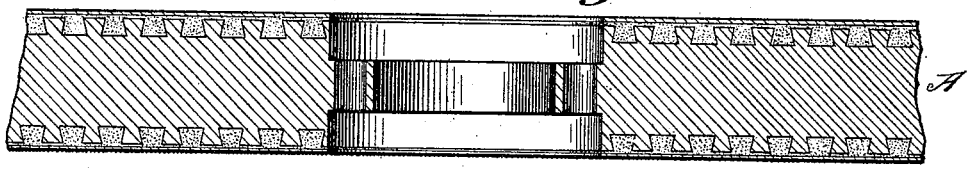
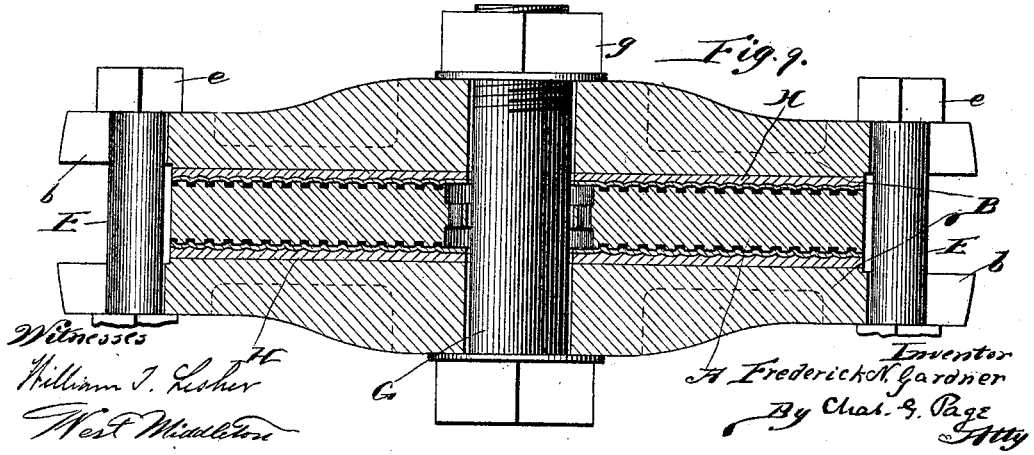


Fig. 9.



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(No Model.) 3 Sheets—Sheet 3.

F. N. GARDNER.

GRINDING AND POLISHING WHEEL AND ART OF MANUFACTURING SAME.

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Fig. 10.

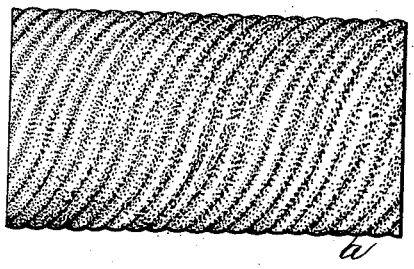
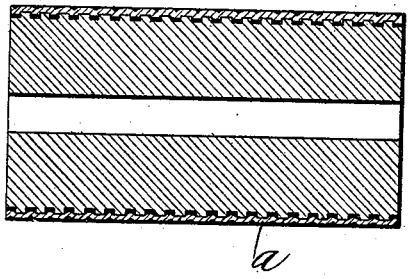


Fig. 11.



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UNITED STATES PATENT OFFICE.

FREDERICK N. GARDNER, OF BELOIT, WISCONSIN, ASSIGNOR TO CHARLES S. BESLY, OF CHICAGO, ILLINOIS.

GRINDING OR POLISHING WHEEL AND THE ART OF MANUFACTURING SAME.

SPECIFICATION forming part of Letters Patent No. 494,472, dated March 28, 1893.

Application filed August 15, 1892. Serial No. 443,071. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK N. GARDNER, a citizen of the United States, residing at Beloit, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Grinding or Polishing Wheels and the Art of Manufacturing the Same, of which the following is a specification.

The objects of my invention, generally stated, are to provide a simple, economical, highly efficient and commercially practical grinding and polishing wheel, having a true, rigid and effective abrading face which is uniformly and rigidly united to the body of the wheel so as to avoid all buckling or other distortion or displacement during use and thereby insure permanency of form so long as the same may be desired, and which, when worn so as to become unfit for service can be readily removed and replaced by another abrading face of like or different grade. Also to provide a grinding and polishing wheel with an abrading face or surface involving the foregoing mentioned characteristics by a simple, novel, improved and highly efficient method.

To the attainment of the foregoing and other useful ends I provide the body of the wheel with a face which is grooved or provided with like defined recesses or depressions and apply thereto a sheet of emery or like abrading cloth or paper, with a layer or body of glue or cement between the two and in sufficient quantity to fill the grooving or like depressions or recesses and coat the ungrooved portion or portions of the wheel. I then place the wheel with the facing thus applied in a suitable press having a pad or platen which is caused to press upon the abrading sheet so as to compress the same upon the wheel and compact and wedge the glue or cement within the grooving, or like recesses or depressions, and in this condition the wheel is allowed to remain until the glue or cement becomes perfectly hardened so as to back the abrading sheet by hardened ribbing or projections countersunk and wedged within the wheel. The pad or platen may, for the broader purposes of my invention, be rigid or proximately so, and in such case the abrading facing will be rendered flat and true, and such glue or cement as may be left upon the ungrooved portion or portions of the body of the wheel will be evenly distributed thereon so as to permit said disposition of the abrading sheet. The pressure thus applied also practically wedges the glue or cement within the grooving and holds the same in such condition until it hardens. The resulting article therefore is an abrading wheel having a grooved or recessed body portion and a flat abrading face formed by a sheet of emery or analogous abrading cloth or paper which is backed by defined ribbing or projections of hardened glue or cement countersunk, wedged and firmly held within the grooving or recess whereof the walls must of necessity have in the first instance some lateral yield under the pressure which forces the glue or cement within the grooving. The provision of ribbing or like projections of hardened glue or cement wedged within the grooving and united with the back of the abrading sheet, also renders it practical to form a rigid union or connection between the abrading sheet and a wheel of metal or analogous hard and dense material having a smooth finish which permits the ready removal of the glue or cement therefrom when it is desired to provide the wheel with a new abrading face, and as a convenient way of removing the abrading sheet the wheel can for example be first soaked in water so as to soften the glue or cement, after which the abrading sheet can be easily stripped from the wheel.

As a matter of further improvement I apply to the wheel having any desired arrangement of grooving or depressions a flexible sheet of emery or analogous abrading cloth or paper or like material with a suitable quantity of glue or cement between the two, and so apply the pressure that the sheet will be depressed within the grooving or depressions which will be otherwise filled with the glue or cement, and in this way, while I attain as before the result of an abrading sheet backed by ribs of hardened glue or cement wedged within the wheel, I also cause the abrading facing to conform to the face of the wheel and hence provide it with grooving or depressions alternating with ribbing or raised portions. While I may apply such pressure in any suitable way, I prefer employing a yielding or

flexible pad or platen adapted to permit the abrading sheet to be pressed evenly and uniformly upon the wheel and to conform to the surface of the same, whether such surface be grooved or provided with any other form or arrangement of depressions, and when the wheel is finished the abrading sheet will for grinding and polishing purposes be practically solid with the wheel.

For the broader purpose of my invention however I do not limit myself to any particular material for services as a platen or pressure device.

In the accompanying drawings Figure 1 is a face view of one form of wheel with the abrading facing removed from its body portion. Fig. 2 is a cross-section through the same. Fig. 3 illustrates a sheet of abrading facing consisting of emery or analogous abrading cloth or paper. Fig. 4 is a cross-section through the abrading facing of Fig. 3. Fig. 5 is a cross-section through the wheel with an abrading facing applied to opposite sides of the body portion and depressed within the grooving thereof. Fig. 6 is a view similar to Fig. 5 but on an enlarged scale. Fig. 7 is a like view with the abrading facing held flat upon the body portion of the wheel. Fig. 8 is a view similar to Fig. 7 with the grooving made dovetail in cross-section. Fig. 9 is a section through a press with the wheel and facing held therein and subject to the pressure of yielding or elastic pads serving to depress the facing within the grooving. Fig. 10 shows in elevation, the wheel made in the form of a cylinder and having its perimeter provided with an abrading facing which is depressed within spiral grooving in the wheel. Fig. 11 is a central longitudinal section of the wheel in Fig. 10.

The wheel can be in the form of a cylinder which has its perimeter provided with the abrading facing, *a*, and said facing, composed of emery or like cloth or paper, can be depressed within grooving in the cylindric surface of the wheel, as illustrated in Figs. 10 and 11 which show a wheel A′ of such character, but as a preferred form, the wheel A is of disk shape with the abrading facing applied to opposite sides thereof. Said wheel can be provided with grooving or depressions of any suitable character and arrangement adapted to permit the layer of glue or cement between the wheel and facing to fill and harden within the grooving depressions and form therein an arrangement of hardened ribbing, or projections whereby the facing of abrading cloth or paper will be backed by rigid and unyielding ribbing or projections which while holding the abrading facing in rigid union with the wheel, will not yield during the process of grinding or polishing. The grooving or depressions provided in the body of a wheel upon which the abrading sheet is to lie flat should also be of sufficient depth to permit the formation of substantial ribbing or projections, which when thus embedded or countersunk within the wheel will firmly hold the abrading facing. The glue or cement employed for thus holding a flat sheet of abrading cloth or paper upon a grooved wheel must be such as will become hard and practically unyielding so as to prevent any and all lateral shift or buckling of the abrading cloth or paper during use, and also so that when compressed within the grooving or projections it will upon hardening form hard and compacted ribbing or projection which is practically wedged within the same, it being also further observed, that for economical and effective grinding and polishing, the wheel should be revolved with great rapidity, and that when so revolved I find the abrading cloth or paper will tend to work loose, particularly when grinding and polishing metal articles, unless the glue or cement employed is hardened and wedged within the wheel as aforesaid. The wheel is desirably of metal, or analogous dense material, which will not warp, but remain in true shape under all conditions, and which will also permit the glue or cement to be removed when it is desired to supply the wheel with a new facing. The removal of the facing can be readily attained by first soaking it in water, after which it can be stripped from the wheel and the latter easily cleaned. The pressure required for compressing the glue or cement and holding the abrading facing until a proper set is secured can be attained by any suitable press.

In Fig. 9 I have illustated as a simple and convenient construction of press a couple of plates or platens B, provided with marginal notches *b* for bolts E which can be placed in the notches and pressure applied by tightening up nuts *e* on the bolts, it being understood that any suitable number of such bolts can be employed. The wheel with its facing can be placed within this press and can be properly centered by a bolt G shown extended through the central opening in the wheel and provided with a tightening nut *g*. Where the abrading facing such as shown in Figs. 7 and 8 is to lie flat upon the wheel, the plates B may constitute the platens, or rigid plates may be used in place of the yielding pads H shown in Fig. 9. With such arrangement the wheel with a sheet of abrading cloth or paper and layer of glue or cement between such sheet and the wheel (upon one or both sides of the latter) can be placed within the press and the latter tightened up so as to compress the glue or cement within the grooving and render the portion intervening between the abrading sheet or sheets and the ungrooved portion of the wheel, perfectly uniform. By thus applying the pressure the abrading sheet will be kept perfectly flat, while the glue or cement will be so compressed within the grooving that upon hardening it will be practically wedged within the same. The wheel is left within the press until the glue or cement so hardens, after which the wheel can be removed and used. I may also depress the

abrading sheet within suitable grooving or depressions in the wheel so as to provide the wheel with an abrading facing having a ribbed, corrugated or analogous surface, the wheel thus prepared and the special mode of preparing it being specifically claimed in my application for Letters Patent of the United States, Serial No. 409,903, filed on or about October 26, 1891, and to secure such end I cause the pressure upon the flexible abrading sheet (placed as hereinbefore described upon the wheel with an intervening layer of glue or cement) to be exerted by some suitable yielding or pliable means or body which when placed upon the abrading sheet and subject to pressure will in turn compress the abrading sheet and cause it to conform to the surface of the wheel.

What I claim as my invention is—

1. An abrading or polishing wheel comprising a main body having depressions, a sheet of emery or analogous abrading cloth or paper, and an intervening body of glue or cement compactly uniting the sheet to the body and compacted within the depressions of the body.

2. The within described improvement in the preparation of grinding or polishing wheels consisting in applying to the surface of a wheel provided with grooving or analogous distinctive recesses an abrading facing consisting of a sheet of emery or analogous abrading cloth or paper with an intervening strata of glue or cement, subjecting the same to a degree of pressure sufficient to compact and wedge the glue in the form of ribbing or like distinctive projections within the grooving or depressions in the wheel and prolonging such pressure until the glue or cement has firmly united with the abrading sheet, and has formed hardened ribs or like distinctive projections countersunk and wedged within the wheel.

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