June 29, 1937. F. W. SAUER 2,085,202

BRUSH

Filed Dec. 27, 1932

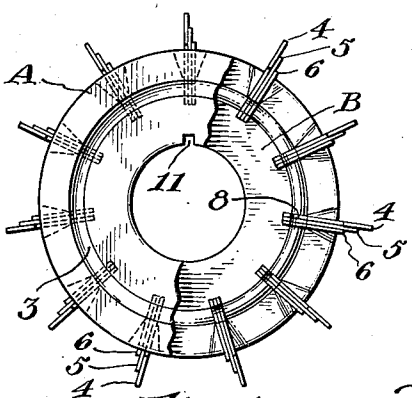

Fig. 1.

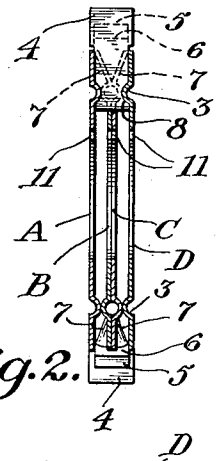

Fig. 2.

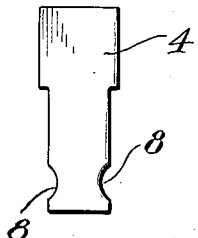

Fig. 4.

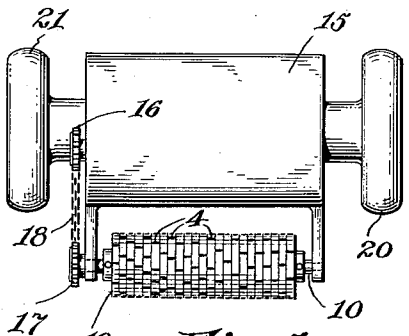

Fig. 5.

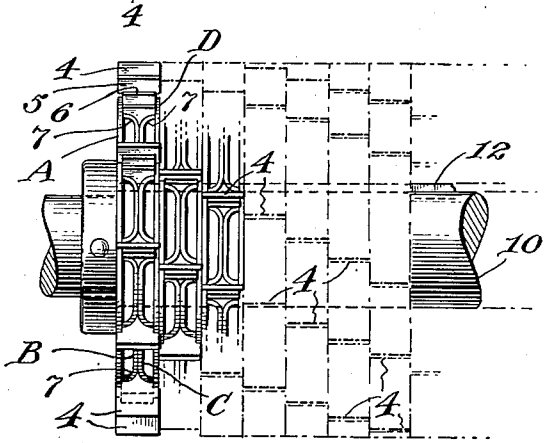

Fig. 3.

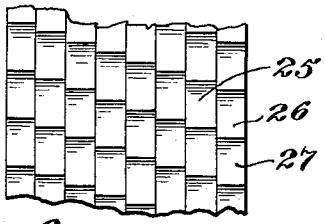

Fig. 6.

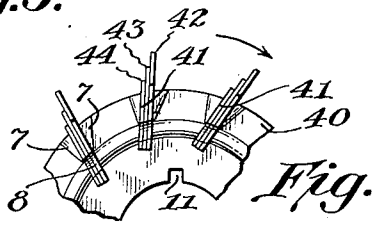

Fig. 9.

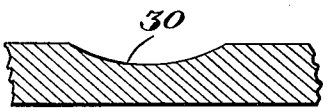

Fig. 7.

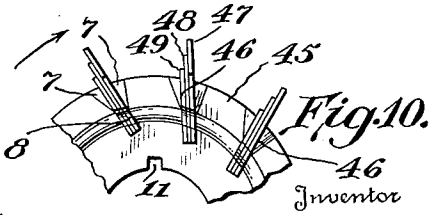

Fig. 10.

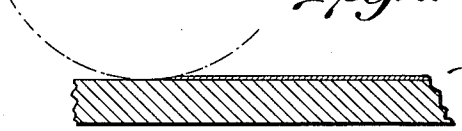

Fig. 8.

Inventor

Frederick W. Sauer

By Fay Oberlin & Fay

Attorneys.

Patented June 29, 1937 2,085,202

UNITED STATES PATENT OFFICE

2,085,202

BRUSH

Frederick W. Sauer, Rutherford, N. J., assignor, by mesne assignments, to Surfacing Wheel Corporation, New York, N. Y., a corporation of Delaware

Application December 27, 1932, Serial No. 649,036

5 Claims. (Cl. 29—78)

The present invention, relating as indicated to a method of, and apparatus for, abrading, cutting and polishing, is more particularly directed to a new and improved method and apparatus for the surfacing of various materials and articles of various kinds, such for example as wood, compositions such as concrete, brick and the like, coated articles carrying a surface coat of paint, lacquer, and the like, rusted articles and metal articles.

One of the principal objects of the invention is the provision of a method and apparatus for economically and accurately removing a given amount of foreign substances from the surface of an article of the type referred to, and leaving a relatively smooth surface.

Another object of the invention is the provision of a method and apparatus for the accurate and economic removal of a desired amount of material from the surface of an article, such for example, as wood, brick, concrete, metal or the like. A further object of the invention is the provision of a method and apparatus for smoothing and polishing the surface of a material, such as zinc, brass, bronze, aluminum, and even harder materials, such as ordinary steel, certain of the bronzes, stainless steel and the like. A still further object of the invention is the provision of a simple element or unit for use in carrying out my improved method of surfacing, which, from the nature of its construction may be readily and easily modified for the carrying out of the various operations and methods referred to above.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawing and the following description setting forth in detail one method and one product constituting, however, but one of the various applications of the principles of my invention.

In said annexed drawing:—

Fig. 1 is a side elevation with parts broken away of one unit embodying my improved invention in one form of apparatus in which it may be employed; Fig. 2 is a central vertical section through the device of Fig. 1; Fig. 3 is a partial side elevation illustrating a series of units shown in Fig. 1 assembled upon a shaft; Fig. 4 is a front view of one of the abrading teeth, or elements; Fig. 5 is a plan view illustrating one form of apparatus in which my improved unit may be employed; Fig. 6 is a plan view of a sheet of metal after being surfaced by my improved method; Fig. 7 is a transverse section illustrating a strip of metal after being cut out by my improved method; Fig. 8 is a similar view illustrating the removal of a coating of paint or varnish from the surface of an article; Fig. 9 is a side elevation of a modification of my improved unit; and Fig. 10 is a similar view showing still another modification.

There are of course many types of surfacing operations, the word "surfacing" being used to denote any operation which affects the surface of an article either by removal of material of which the article is formed, the removal of some foreign material in the form of a coating on the article or the polishing or decorating of the surface of an article. For example, articles formed of wood, metal and various compositions are surfaced when the cutting tool is applied to the article to remove some of the material thereof. Again, coated wooden or metal articles, such as painted floors, painted or rusted metal sheets or the like, are surfaced by having the coating removed, in which case the surfacing operation is ordinarily not a true cutting operation, but a form of abrasion being ordinarily carried out by by means of a brush or similar tool. Articles which have irregular surfaces, such as castings, some types of rolled metal sheets, articles of aluminum, zinc, brass and the like, are surfaced by polishing operations which remove a small amount of metal, but in which the tool employed, which is ordinarily an abrasive tool of some type, first cuts down or rubs off projecting particles from the surface and then smoothes and polishes the entire surface to a reflecting or shiny finish. The type of tool employed for these various surfacing operations depends upon the amount of material to be removed, the nature of the material and the finish desired, and ordinarily various types of tools have to be employed for the different operations.

The principal object of the present invention is the provision of a method and an apparatus affording, to a large extent, a universal action in the fields referred to and one which, with minor modifications, is capable of acting either to remove a part of the material of which the article is formed, a coating applied thereto or to remove material and then smooth and polish a given surface, whether the surface is a coating applied relatively thinly over the surface of an article of some other material, or is merely the surface of a homogeneous article of a similar material.

My invention will be best understood by reference, first, to a unit or element which I have

designed for carrying out the various modifications of the method hereinafter to be described in some detail. Briefly stated, this member consists of cooperative adjacently arranged retaining members, between which are rigidly mounted spaced projecting, reinforced but resilient cutting elements which are preferably formed of relatively thin material and are desirably made of a metal such as vanadium steel. It will of course be understood that my improved element may be constructed in various forms, either as a wheel, plate, belt or the like, depending upon the type of apparatus in which it is to be used and the type of material upon which it is to operate, but in the present application I have illustrated its construction as a wheel only.

Referring now to Fig. 1, I have shown one form in which my improved form can be employed (see Figs. 1 and 2), of spaced discs A and D provided with circumferentially extending ribs 3 therein, and conjointly holding therebetween a series of abrading or cutting teeth, or elements 4, and reinforcing members 5 and 6 therefor, The two cooperating discs B and C are provided with radially disposed slots in which the elements 4, 5 and 6 are assembled in the manner shown in Fig. 1, being snugly disposed in the slots and being supported against circumferential pressure by means of outwardly turned lips or edges 7 (see Fig. 3). The cooperating disc D is provided with a similar locking ring or rib 3 adapted to engage in the recess 8 formed at the inner lateral edges of the teeth 4, as indicated in Fig. 2, so that each of the teeth 4 and the supporting plates 5 and 6 are mounted and supported in their circumferential movement by the edges 7 of the intermediate discs B and C, and are locked against lateral movement by means of the adjacent discs A and D, the ribs of which engage in the recesses 8. These ribs also maintain the three plates 4, 5 and 6 in the predetermined relation illustrated in Fig. 1, which will, of course, vary somewhat in different styles of units, depending upon the severity of the operation for which each unit is intended.

The previously described unit is shown as consisting of four discs A, B, C and D, and is made in this fashion for the reason that such discs may be economically produced by some such operation as stamping. It will, of course, be understood that the unit may be made up so as to consist of a single solid member in which case the blades 4, 5 and 6 would necessarily be assembled during the manufacture of the single disc. It is also possible that the disc could be made of two cooperating members somewhat similar to a right and left half composed respectively of A, B and C, D.

A number of individual units illustrated in Fig. 1 may be mounted upon a shaft 10, as shown in Fig. 3, in such an arrangement that the spaced teeth 4 in each unit are staggered with respect to the nearest teeth in the adjacent units in order to give a substantially uniform and continuous cutting and abrading action. The individual discs may be provided with keyways 11, or other means for engagement with a key 12 upon the shaft 10, and the assembled discs may then be locked upon the shaft in any suitable manner.

The assembled unit may then be employed in various types of discs, either portable or stationary, as for example, in a tool such as is shown in Fig. 5. In this figure is shown a frame or casing 15 within which may be mounted any suitable source of power, such as an electric motor, driving tool, gears 16 and 17 and chain 18, on the shaft 10 of which is mounted an assemblage of my improved units 19. Suitable handles 20 and 21 are provided at convenient points upon the casing 15, and it will be understood that the machine thus diagrammatically illustrated is merely one of numerous forms of apparatus in which my invention may be employed.

The teeth 4 and the supporting or reinforcing strips 5 and 6 may, of course, be varied in their length and the supporting strips in their number and in the extent in which they overlap and support the cutting tooth as the nature of the work requires. For convenience, however, we have formed all of these elements of the same material and of relatively thin stock. A thin ribbon of a material such as tempered vanadium steel has been found extremely satisfactory and, in these sections, is relatively inexpensive, easy to form and assemble and lasting in use.

I have already explained that the type of unit illustrated in Fig. 1 may be varied, depending upon the material to be operated upon, and in Figs. 9 and 10. I have shown two modifications of the unit of Fig. 1. In Fig. 9 I have shown discs 40, which in general correspond to the discs B of Fig. 1, but are provided with slots 41 arranged at an angle to a radial line passing therethrough to receive angularly directed cutting blades 42 and supporting blades 43 and 44. This type of unit is intended to operate in the direction indicated by the arrow in Fig. 9 for removing and cutting material of a soft character, such for example as aluminum or brass. In Fig. 10 I have shown a similar construction, in which discs 45 are formed with slots 46 receiving a cutting blade 47 and supporting blades 48 and 49 adapted to operate in the direction of the arrow there shown for the purpose of polishing soft materials, such as lead, aluminum, brass, and the like.

My improved method of surfacing consists in applying to surfaces to be removed a unit having a series of rigidly mounted, but slightly yielding, cutting, abrading or swaging elements, or teeth, and thus continuously scraping, cutting or swaging the surface of the article through the application of innumerable blows by elements which are sufficiently yieldable to absorb shocks and prevent breakage, although sufficiently rigid to exert the scraping, cutting or swaging action desired upon the surface being operated upon.

By varying the speed of operation, various speeds of stock removal can be secured on the same type of material, and also various types of finish can be left on the surface.

In Fig. 6 for example, I have illustrated the surface resulting on a piece of soft brass after removal of a certain amount of material by relatively slow operation of a unit of the type shown in Figs. 1 and 3, the unit at the same time being moved over the surface of the brass article to allow each of the abrading elements to strike a different spot on the article, although the movement of the tool is not so rapid as to leave any portions of the surface in their original condition.

From this operation there results a surface consisting of a series of slightly curved or concave rectangular spots 25, 26, 27, etc., all of which adjoin each other and are bounded by more or less definite limits determined by the softness of the material, the pressure with which the operation is carried out and the speed both of rotation and the movement of the tool over the surface of the article. Precisely the same

unit operated at the same speed, but with more pressure against the work and more movement of the unit over the work will produce in an article such as concrete, brick, or the like, as shown in Fig. 7, a recess 30 in a remarkably short space of time. By moving the unit slowly over the surface any desired amount of material can be very rapidly removed from such articles, such as refractory brick, uneven or irregular burned or clay products, concrete, or the like.

In the removal of such coatings as rust, paint, varnish, lacquer, and the like, it is possible by my improved method to accurately remove the coating alone, leaving the original surface of the article undisturbed, which is seldom the case when such articles as wire brushes are employed for this purpose, as such articles do not have the tips of their wires in anything like the circumferential plane resulting in a removal of the surface coating, but accompanied by an abrasion or removal of the article beneath.

In the process of removing the coating alone, as shown in Fig. 8, it is important that no longitudinal lines be left such as those shown in Fig. 6, and such an object may be readily attained by extending the outer portion of the blade 4 so that adjacent blades overlap each other. This can best be understood by an inspection of Fig. 3 in which the blades 4 are shown as stopping on a line drawn transversely to the shaft 10. Obviously, it is possible to form a line for various widths, or on the other hand to entirely obliterate any line by means of extending the outer overlapping portion of the blades 4 or restricting such portions in an axial direction.

My improved method and apparatus permits of a combination of cutting and abrading which is very much faster than an abrading action alone, although not so rapid as a cutting action by a special design of cutting tool made for a particular purpose. For a universial action, however, my combination cutting and abrading element serves remarkably well for action upon various types of materials, and since it is an accurate tool in the sense that the cutting or abrading elements be in the same circumferential plane, it is capable of performing extremely accurate work, and satisfactorily rapid work upon all but the hardest materials.

Depending upon the material which is to be operated upon, I employ one, two, three, or even more leaves to support each of the cutting elements. The same considerations determine the exposed length of each cutting element, and the type of material which is employed therefor.

For general use upon various materials I have found that three leaves, as illustrated in Fig. 1, provide a very satisfactory operation, if formed of ordinary spring steel. In case of breakage of any of the cutting elements, which rarely occurs in ordinary operation by reason of the yielding support afforded the exposed or cutting parts of each element, it is a simple matter to disassemble the separate units from a shaft, separate adjacent discs and insert either new cutting elements or new supporting plates, as may be required. The cost of the unit illustrated in Fig. 1 is extremely low, as it consists entirely of stampings there being but two pairs of identical supporting discs, and three lengths of identical strip material employed. If desired, adjacent discs may be welded, bolted, or otherwise secured together, either permanently or removably, depending upon whether the operation for which the unit is intended is one likely to cause some breakage of cutting teeth, as otherwise it does not pay to replace new teeth in old discs by reason of the extremely low cost of the unit as originally manufactured.

Among the advantages of my improved method and the apparatus described are that the element is self-cleaning and self-cooling, that the cutting or abrading elements do not clog, and do not crystallize, due to the supporting leaves which hold the cutting, i. e., the longest blades, to a curved flexure instead of a hinged flexure. Other advantages are the adaptability of the unit to the removal of various types of material, hard, soft and intermediate, and the simplicity of manufacture and of assembly of the devices into a unit of any desired length. With a relatively small number of disc diameters complete units of any desired diameter can be secured while the length of the article can be readily varied by adding or subtracting units in the assembly.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a cutting or scraping tool of the character described, a complete, individual and removable unit comprising a plurality of radial discs of pressed metal permanently secured together, a plurality of flat resilient blades, means to rigidly secure said blades at their inner ends between certain of said discs, the outer ends of said blades extending beyond the periphery of said discs, other of said discs being formed with radial notches the sides of which are deflected to form laterally extending abutments on said discs abutting the flat medial portion of said blades and limiting the flexible movement of the latter.

2. In a cutting or scraping tool of the character described, in combination, a complete individual and removable unit comprising a pair of radial discs each formed with laterally extending circumferentially spaced abutments, said discs being so disposed that said abutments are in abutting relationship to space the discs, a plurality of flat resilient blades, means to secure the inner ends of said blades between the discs with the outer ends of the blades extending beyond the periphery of said discs and the flat medial portion of said blades abutted by adjacent abutments to limit the flexible movement of the blades and means to permanently secure the discs together.

3. In a cutting or scraping tool of the character described, in combination, a complete individual and removable unit comprising a pair of radial discs each formed with laterally extending circumferentially spaced abutments, said discs being so disposed that said abutments are in abutting relationship to space the discs, a plurality of flat resilient blades, means to secure the inner ends of said blades between the discs with the outer ends of the blades extending beyond the periphery of said discs and the opposed faces of said abutments being disposed in planes angularly related to radial planes of the tool.

4. A cutting or scraping tool of the character described comprising a plurality of complete individual and removable units juxtaposed upon a shaft, each of said units comprising a pair of radial discs each formed with laterally extending circumferentially spaced abutments, said discs being so disposed that said abutments are in

abutting relationship to space the discs, a plurality of flat resilient blades, means to secure the inner ends of said blades between the discs with the outer ends of the blades extending beyond the periphery of said discs and the flat medial portion of said blades abutted by adjacent abutments to limit the flexible movement of the blades, means to permanently secure each pair of discs together and means to secure the plurality of pairs on the shaft.

5. In a cutting or scraping tool of the character described, in combination, a complete individual and removable unit comprising a pair of radial discs of pressed metal formed with radial notches, the sides of which are deflected to form laterally extending abutments, a plurality of flat resilient notched blades disposed in each of said notches, the outer ends of said blades extending beyond the periphery of said discs, and the flat medial portion of said blades being abutted by the laterally extending abutments of said discs whereby the flexible movement of the blades is limited, and a pair of radial discs between which the first pair of discs and the blades are disposed in abutting relation and formed with ribs entering the notches on the blades to rigidly secure the blades at their inner ends.

FREDERICK W. SAUER.