(No Model.)

A. JOHNSTON.

MEANS FOR GRINDING CUTLERY OR OTHER ARTICLES.

No. 465,376. Patented Dec. 15, 1891.

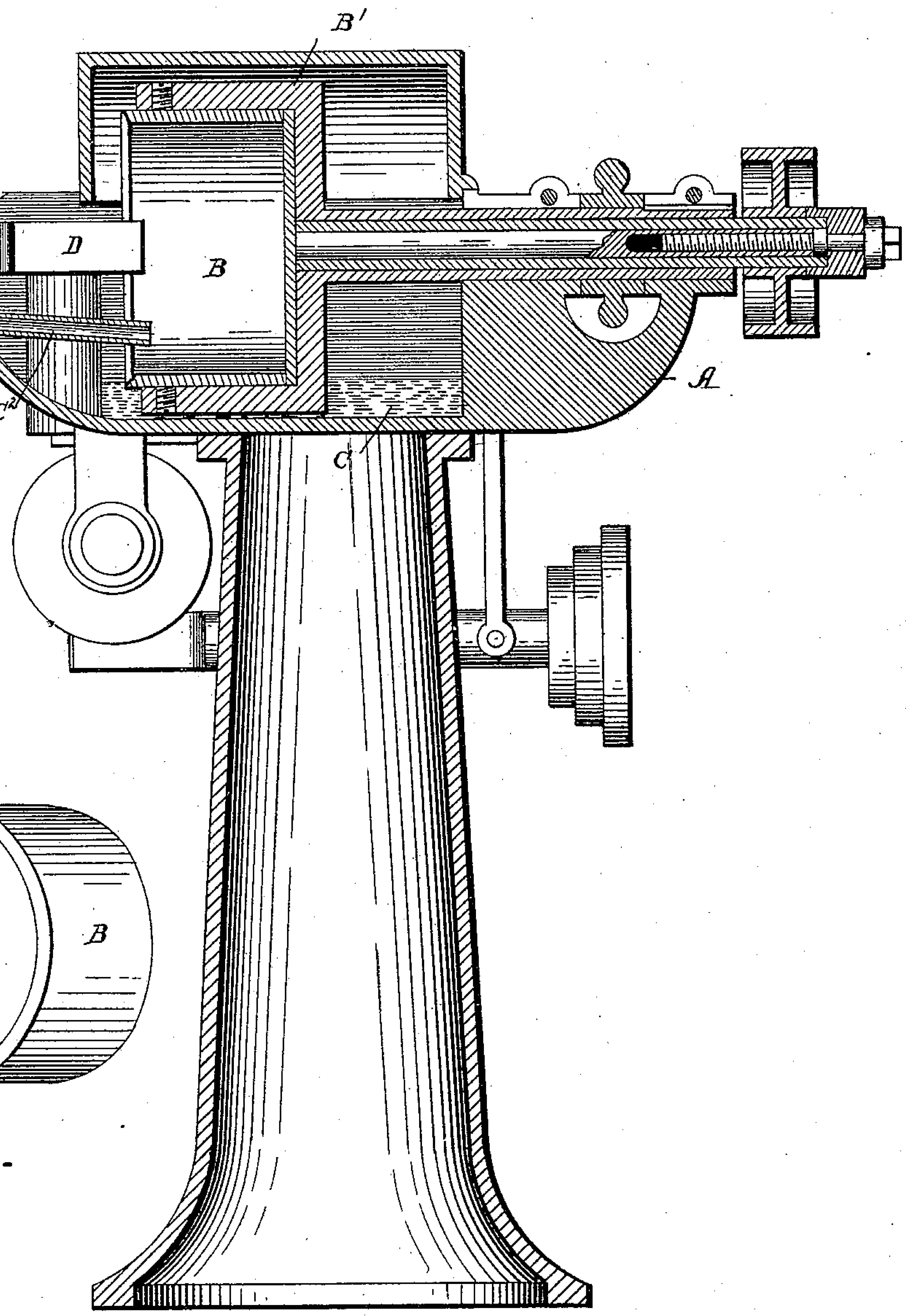

FIG. 1.

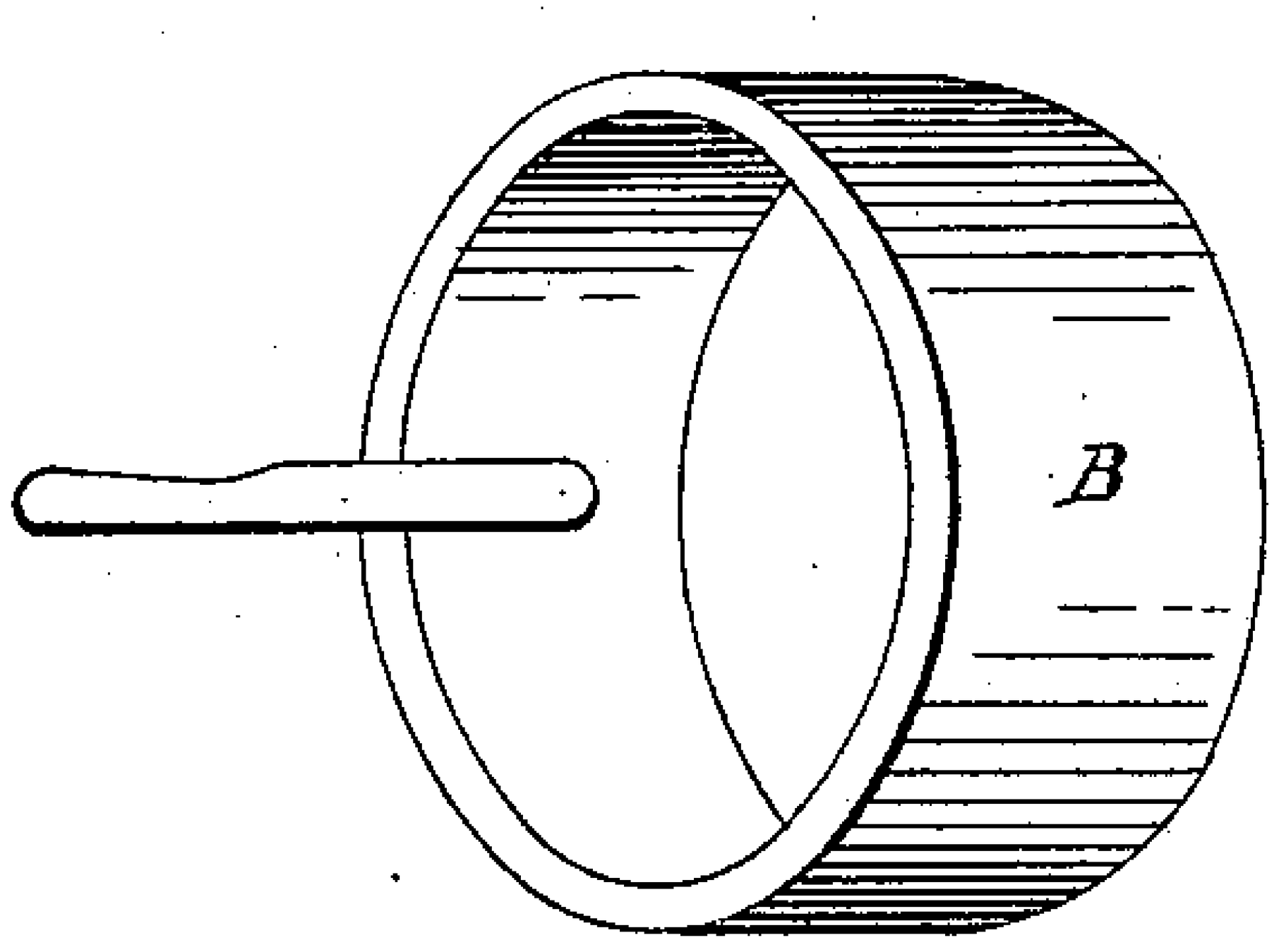

FIG. 2.

Witnesses;
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UNITED STATES PATENT OFFICE.

ALLEN JOHNSTON, OF OTTUMWA, IOWA.

MEANS FOR GRINDING CUTLERY AND OTHER ARTICLES.

SPECIFICATION forming part of Letters Patent No. 465,376, dated December 15, 1891.

Original application filed June 13, 1888, Serial No. 276,947. Divided and this application filed January 6, 1891. Serial No. 376,902. (No model.)

To all whom it may concern:

Be it known that I, ALLEN JOHNSTON, a citizen of the United States, residing at Ottumwa, in the county of Wapello and State of Iowa, have invented a new and useful Improvement in Means for Grinding Cutlery and other Articles, which improvement is fully set forth in the following specification.

The present invention has reference to means for grinding cutlery and other articles made of tempered steel, such as knives, mandrels, spindles, dies, &c. The said means that are described and claimed herein are the same as described in my original application Serial No. 276,947, filed June 13, 1888, of which the present is a division and continuation. In the manufacture of such articles attempt has frequently been made to utilize emery grinders in place of the ordinary grindstones; but up to this time the emery grinders have to a limited extent only superseded the old grindstones, and have no especial advantage over the latter for the purpose specified.

With the object of improving the operation of grinding, particularly when emery-wheels of ordinary composition are used, I have devised heretofore a hollow or cup-shaped grinder, provided with means for supplying water to the interior thereof, so that the centrifugal action of the revolving stone would carry a thin film of water between the grinding-surface and the article being ground thereon. Such device is described in my patent, No. 377,201, dated January 31, 1888. This stream of water served to conduct away the heat generated by the friction of the parts in contact and tended to the accomplishment of the desired object. There still remained, however, serious difficulties which render the grinding of cutlery and other like articles a costly operation, and with the object of removing these I have undertaken a long investigation of the action of ordinary grinders and the difficulties arising in their use. The emery-wheels most favored by manufacturers are those compounded by means of vitreous material and known as "vitrified" wheels. In observing the action of these wheels it is noticed that after a short period of use small particles of steel become firmly attached to the grinding-surface and project so far from the face thereof that the knife-blade rides on the top of these particles, instead of coming in contact with the abrading material. In continuing to use such a grinder the friction of the steel blade and steel particles causes intense heat, which has two detrimental effects. First, it causes more steel particles to become welded by heat to those already adhering to the grinder, rendering the latter worthless without tedious and costly redressing, and, secondly, it draws the temper from the blade. This difficulty is intensified when an automatic feed is employed, for, since the wheel ceases to grind and the feed keeps on increasing the pressure, the heating and consequent damage to the blade and grinder are proportionally increased. Furthermore, in grinding lathe-spindles, mandrels, and similar articles that are to run in journal-boxes in which a perfectly smooth surface is a desideratum, it is found that fine grains of emery become embedded in the surface of the steel. If the spindle so made be started in its boxes with plenty of oil, the stream of oil from the bearings will be found copiously mixed with brass-dust cut by the particles of emery from the journal-boxes. In grinding a mandrel, which is done for the reason that they are ordinarily left by the ordinary turning-lathe out of true—that is, with more metal on one side than on the other—heat will be generated on that side which requires to have the most metal removed, causing it to expand toward the grinding-wheel and to bend by reason of such expansion. The grinding being continued, the wheel removes from the heated and expanded side more than the desired amount of metal, so that when the mandrel cools and contracts, bending back to the original position, it will still be untrue. Further grinding to correct this difficulty merely transfers the excessive removal of metal to the other side of the mandrel, rendering it very difficult to produce mandrels that are perfectly round and true. It should also be stated that the cost of commercial emery-wheels is extremely high, considering the cheapness of the materials composing it, being about eight times the cost of such materials. The explanation of this is found in the fact that the process of manu-

facture is very uncertain, and that a large proportion of the wheels made are broken or from various defects are found to be unfit for use and sale. After much experiment I have been able to remove these difficulties completely by means of the present invention, which consists in the use of a hollow or cup-shaped grinding-wheel, in which the abrading particles are compacted by a binding material which will melt before a temperature is reached sufficient to draw the temper, the wheel being capable of containing water and of spreading it by centrifugal action over the grinding-surface.

By means of this invention the following results are obtained: first, production of a greater amount of work in a given time, as illustrated by the fact that a knife-blade can be completely ground from an ordinary steel blank by two movements (one for each side of the knife) back and forth across the grinding-surface; second, uniform and superior product, the temper not being in the least degree impaired; third, economy in the grinding-wheels, there being no adherence of steel particles and no necessity for redressing; fourth, further economy due to the fact that wheels made as herein described are far cheaper in construction than vitrified or vulcanite wheels, are not likely to be spoiled in making, and when made will last somewhat longer than vitrified wheels; fifth, the production of perfectly smooth and true cylindrical articles, due to the fact that the article is ground always with a clean wheel, and that before any injurious heat sufficient to produce the effects above pointed out can develop, the binding agent would soften and disintegrate. In connection with the employment of a wheel of this kind, the use of water in abundance is of the most importance, not merely to keep the grinding-surface clean and remove detached particles, but to prevent the heating of the wheel to such extent as to soften and render it unfit for use, as would otherwise very quickly occur.

The composition of materials which I ordinarily prefer to use to make the emery-wheel consists of nine parts, by weight, of pulverized emery and one part of shellac, which are heated to or above the melting-point of the shellac and thoroughly mixed together and then pressed into a suitable mold to form the shape of wheel desired. When cold, the emery-wheel will be ready for use, and it will melt, soften, or disintegrate before it will heat the knife or article being ground hot enough to draw its temper. The melting or disintegration of which I speak of course takes place only at the surface of the wheel directly in contact with the heated knife, and this emery-wheel will wear away smooth the same as any other emery-wheel.

Another formula which I sometimes use is: by weight, sixteen parts of pulverized emery, two parts of shellac, and one part of plaster-of-paris, all heated hot enough to melt the shellac, thoroughly mixed and pressed into molds. This makes a somewhat harder wheel than the former and is better for some purposes. The shellac may also be cut with alcohol, thoroughly mixed with the emery, and then poured into molds and allowed to remain until dry; but this consumes more time.

There are of course various other materials than shellac known to those skilled in the art which will hold the emery together when cold and will melt or soften and permit the emery again to disintegrate before it will heat the article ground thereon sufficiently to draw its temper, and among such materials suitable to use I may mention, for the sake of illustration, brimstone and also the various gums similar in nature to shellac.

In the accompanying drawings, which form a part of this specification, I have shown at Figure 1 a sectional view of a machine suitable for the purposes of the invention and in Fig. 2 a perspective view of a hollow emery-wheel.

In said drawings, A represents the frame of the machine; B, the hollow emery-wheel; B′, its revolving holder, and C the water through which the emery-wheel revolves. C′ is the elevated compartment of the water-trough, into which the water or other liquid—oil, for example—is constantly elevated or delivered by the centrifugal action of the revolving emery-wheel and its holder, and C^2 is the spout leading from this upper compartment and by which the water or other cooling-liquid is constantly delivered upon the inner periphery of the revolving cup-shaped grinder B, so that the centrifugal action thereof will flow or spread the liquid constantly over the bevel-edge grinding-surface of the hollow emery-wheel at the place where the grinding is being done. D is the knife or work holder by which the article being ground is automatically reciprocated in and out of the hollow grinder over and parallel to its inside conical end surface and held or pressed against such grinding-surface during the grinding operation. The construction and operation of these parts are fully shown and described in my said former patent, No. 377,201, to which reference is hereby made, and need not therefore be here again described more particularly than I have done above, as my present improvement is independent of the particular construction of grinding-machine which may be employed.

The hollow cylindrical emery-wheel B is of such composition of materials as that it will melt, soften, or disintegrate before the article being ground is heated hot enough by the abrasion to draw the temper of the steel, so that the article being ground may be fed across and pressed against the internal conical end face or edge of said emery-wheel automatically or by machinery without danger of injuring the steel by overheating.

In finishing or grinding knives or other steel articles where a fine finish is required

from an article that already has a tolerably smooth surface the use of a very fine emery, such as that known commercially as "No. 180," or even flour-emery would be used in making the emery-wheel, and instead of water oil would be used during the grinding operation to cool and clean the surface of the article being ground. If, on the other hand, the surface is rougher, as is the case with a knife as it comes from the forge, it would be necessary to use an emery-wheel made of coarser emery first and water to cool and clean the article being ground, and afterward the fine wheel and water are used to finish or polish the surface to the required fineness.

In case a mandrel or other round article of iron, steel, or other metal is to be ground upon a hollow or cup-shaped emery-wheel the article will of course be made to revolve while being ground.

In grinding shafts, spindles, or mandrels or ends thereof that revolve in journal-boxes the article may be held against the internal inclined edge of the wheel in a position analogous to that shown for the knife in Fig. 2, said article being also revolved during the grinding operation. The length and diameter of the grinder and its holder may of course be increased or diminished, according to the size and shape of the article to be ground.

The machine illustrated by way of example in the accompanying drawings is not especially adapted for grinding mandrels, reamers, dies, and similar articles. For such purposes it is preferable to employ a machine such as described in my application of even date herewith, Serial No. 376,901.

Having now fully described my said invention, what I claim, and desire to secure by Letters Patent, is—

In a grinding-machine, a hollow or cup-shaped grinder composed of an abrading substance and a binding agent which fuses or disintegrates under a less heat than will draw the temper of steel, combined with means for supplying water to the interior of said wheel, substantially as and for the purposes set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ALLEN JOHNSTON.

Witnesses:
J. T. HACKWORTH,
A. G. HARROW.