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PROCESS AND PRODUCTS IN THE ART OF FORMING, MACHINING, AND THE RECOVERY OF THE PRODUCTS THEREOF, OF METALS

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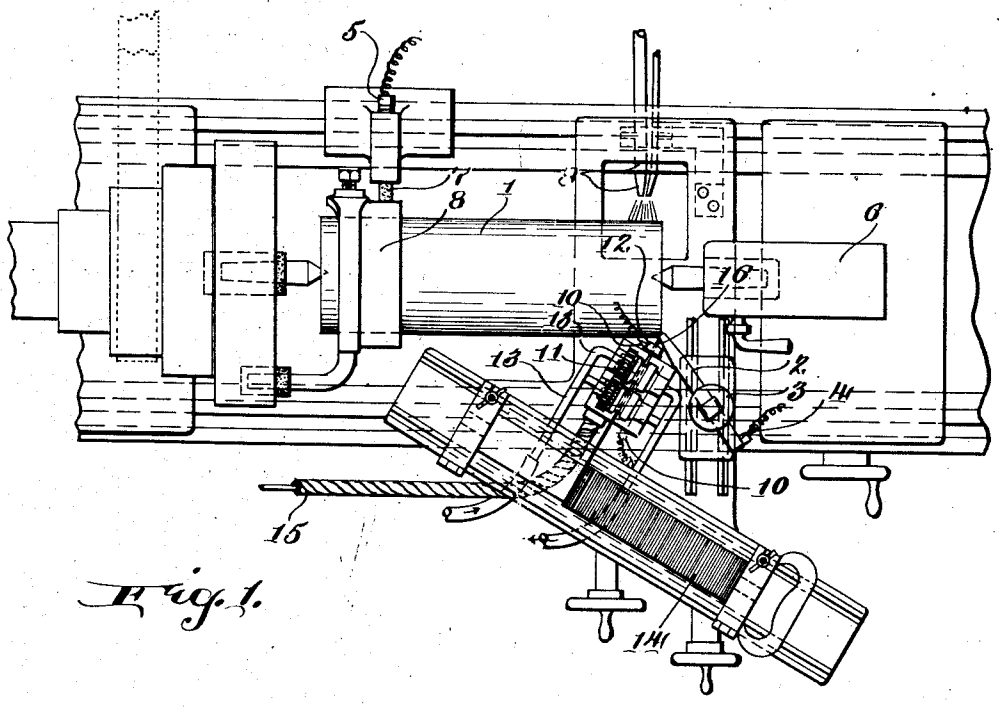


Fig. 1.

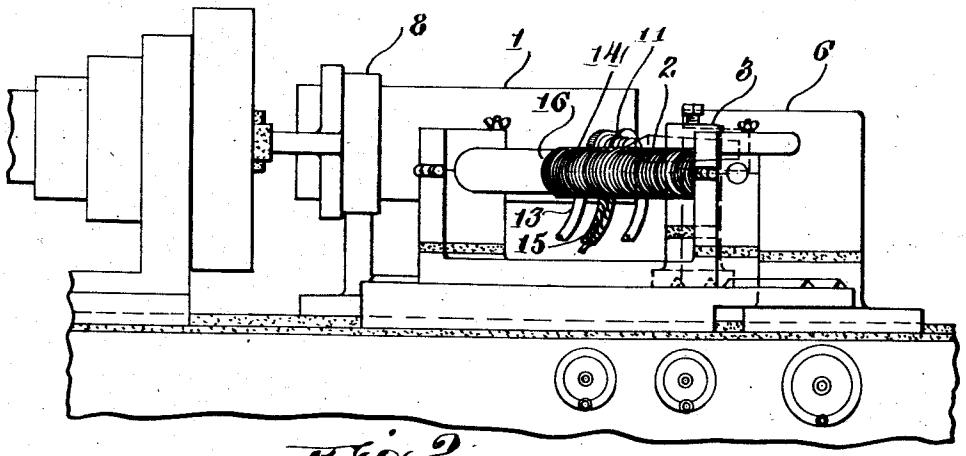


Fig. 2.

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UNITED STATES PATENT OFFICE

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PROCESS AND PRODUCTS IN THE ART OF FORMING, MACHINING, AND THE RECOVERY OF THE PRODUCTS THEREOF, OF METALS

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The object of our invention is the providing an improved process for treating the results of cutting metal.

A further object of our invention is an improved process for cutting metal.

A further object of our invention is the treating of chips or turnings at the time of their making to render the same into a shape desired.

A further object of our invention is the providing an apparatus for heating the point of contact of a cutting tool on metal.

A further object of our invention is the process of cutting metal at a point heated for such purpose.

A further object of our invention is the process of heating metal being cut in the vicinity of the point of cutting whereby said metal is made ductile at that point.

A further object of our invention is the process of heating a metallic substance to be cut at the point of cutting to such a degree as to render said substance more susceptible to cutting.

A further object of our invention is an improved process for drawing wire while the metal is in a heated condition, with and without drawing dies.

A further object of our invention is the process of obtaining a cutting from metal substantially intact and homogeneous.

With the foregoing and other objects in view, our invention consists of the methods employed, combination and arrangement of systems, apparatus and means as hereinafter specifically provided and illustrated in the accompanying drawing wherein is shown the preferred embodiment of our invention; but it is understood that changes, variations and modifications may be resorted to which come within the scope of the claims hereunto appended.

We have discovered that by using self-hardening tools of certain desired types that will stand very high temperature in operation, and heating the tool in the vicinity of its operation, or the metal acted upon, the surface of the metal acted upon at that spot is rendered more ductile, easier to cut and the result of the cutting in the shape of a chip is rendered ductile and may be shaped and drawn off as a continuous result.

We have also discovered that wire, or ribbons, of considerable length may be cut, turned or otherwise separated from the body of the metal by a cutting tool operating under a temperature sufficiently high to render said wire, or ribbon, ductile at the point of cutting whereby the same may be shaped or straightened, as desired.

While any suitable means for heating may be used, we have shown two modifications, one electrically heated and the other gaseously heated; but we do not wish to limit ourselves to any particular means for this purpose, as either means, or a combination of both means described, or any other well-known means, may be resorted to.

In the drawing of the herein-described embodiment of our invention, Figure 1 represents a partial plan view of a lathe in which a mass of metal is operated upon and from which a cutting or a turning is to be taken, 1 being the body of the metal, which may consist of nichrome or any metal from which a shaving is desired or which it may be desired to shape; the metal mentioned is used where electric resistors are desirable. We show that simply for illustration, as ordinary metals may be used where large cuts, or hogging, is desired

Fig. 2 is a side view in elevation of the apparatus shown in Fig. 1.

Similar numerals refer to similar parts throughout the several views.

1 is the body of metal to be operated upon, either for shaping into a desired form or for obtaining cuts therefrom for a product. If electric resistors are required, nichrome or some similar ferric alloy is preferably used. The process herein described enables very hard and brittle metals to be operated upon by means of bringing them to a ductile condition by heat while being cut. Body 1 is shown as positioned in a lathe between the centers and revolved by means of a dog attached thereto.

2 is the cutting tool which may be made from metal of the self-hardening type such as Tunston Carbide, trade name Carb-Alloy,

Straus Metal, Acerite, Stellite, or some other well-known alloy that will stand red or white heat and maintain its hardness while under such heat in cutting operation. This cutting tool is supported by and insulated from a carrier or tool post 3, which tool post is provided with means for feeding into the work and along the work as is usual in lathes, either by hand or by automatic means.

An electrode 4 is attached to cutting tool 2. Another electrode 5 is attached to the lathe either at tail stock 6, or some other part, when work body 1 is not insulated from the lathe. If it is desired to insulate body 1 from the lathe by means of insulations on the centers and dog, then brush 7 operates on the body 1 directly or on a collar 8 on the dog, whichever is most convenient; the dog and its collar 8 being in electric contact with body 1, the projection of the dog into the face plate being insulated. Electrodes 4 and 5 connect with a generating apparatus not shown, whereby a current of considerable volume sufficient to heat the point of contact flows between cutting tool 2 and the body of metal 1, care being taken, however, to keep this current below that required for fusing the metal at that point to prevent welding or a dropping of the metal, it being desired to draw the same away intact.

In large masses, or bodies of metal 1, of certain types it is desired to assist the electric heating or to entirely do away with the same to get a more general softening, and this is accomplished by mass heating as shown by gas-heater 9 which is of the ordinary oxo-hydrogen, or acetylene, blow torch type, as shown; but any means for heating the body of metal may be used. It might be remarked here that the lathe and centers working parts are constructed in design and of material to carry a highly heated body 1.

The two principal means illustrated for heating may be used in conjunction with each other, or each may be used independent of the other, depending upon the character of work to be done. If the shape of body 1 is the principal object to be attained mass heating as accomplished by the blow pipe is preferable to the electric heating accomplished between the points of contact, as extremely large cuts may be taken in the soft ductile metal rendered so by heating.

10 is an electrode attached to the drawing mechanism, or rolls, 11. This drawing mechanism is insulated, as is also the coiling mechanism. Electrode 10 and electrode 2 are on the same side of the generating apparatus, and by well known proper means the current can be relatively regulated between the two, the object being to pass as much current as is necessary through the wire chip or other product being cut from body 1, to properly soften, anneal, or otherwise condition the product for stretching without dies or drawing through dies.

The drawing mechanism, as stated, consists of rolls which will roll the chip into a desired form, such as a square, or circular, bar, or will draw the chip faster than the same is being formed so as to stretch the chip, or the rolls will draw the cooled product after it has passed through a die 12. Where uniformity of wire is desired, with polish and softness, the die is used preferably formed of a self-hardening steel or of the materials mentioned to stand heat. If a die be used, electrode 10 is connected with the same. The drawing mechanism, or rolls, 11 has means provided for keeping the same cool, by passing water or other fluid through the same by means of pipes 13 which may be regulated as desired by proper stop-cocks, not shown.

The product, or wire, after having passed the drawing mechanism, or rolls, 11, is wound on coiling mechanism 14, which mechanism, as suggested above, is insulated and may be automatically driven and fed.

The drawing mechanism or rolls 11 is operated as shown by flexible shaft 15 from any convenient source of power that can be regulated as to speed. This is shown simply for convenience, as in practice, a flexible shaft would not be used as considerable power is required and a direct drive is preferable.

The operation of our process is as follows:

A piece of metal 1, being properly positioned, is rotated at a desired speed. The blow-pipe 9 being lighted heats the surface and a considerable portion of the body 1 substantially to redness, cutting tool 2 being properly positioned for either transverse feeding or longitudinal feeding, cuts chip 16. This chip may be of most any shape found convenient to produce a desired shape by the cutting tool, and if it shows any tendency to fracture, or where greater ductility is required, electric current is turned on to electrode 4 which flows between the cutting tool 2 and body 1 at the point of cutting. This has a tendency to soften the immediate vicinity for cutting. If this is getting too soft to permit of a proper drawing the product itself between the die 12 and the point of cutting may be heated by current passing through electrode 10 and the current reduced through electrode 4, thus softening the wire on its entering the die, if a die is used; if not, it permits the drawing rolls to stretch the product between the rolls and the point of cutting, the rolls giving it the desired cross-section shape and cooling the same after which it is found on its coil.

By the above process and means described, metals heretofore unavailable for wire, electrodes and the like, may be easily formed into shape.

Having thus described our invention, what

we claim and desire to secure by Letters Patent is:

1. The process of wire making and drawing consisting of cutting a strip of metal from a mass and drawing the same therefrom and between said point of drawing and said mass where the cutting takes place heating said strip.

2. The process of forming wire consisting of separating a continuous cutting from a substance when in a plastic condition, then reducing said cutting in sectional area.

3. The process of forming wire consisting of separating a continuous cutting from a substance when in a plastic condition, then reducing said cutting in sectional area while said cutting is maintained in a plastic condition.

4. The process of metal working consisting of separating from a mass supply of metal in a contiuous manner a small portion thereof from a point of said mass locally softened to facilitate such separation, and stretching said separated portion from the point of separation to reduce the cross-section area thereof.

5. The process of metal working consisting of separating from a mass supply of metal in a continuous manner a small portion thereof from a point of said mass locally softened to facilitate such separation, and drawing said separated portion through a die.

6. An apparatus for metal working comprising means for insulating the work to be operated upon, means for moving said work and a cutting tool cutting therefrom relatively so that a cutting is made thereof, and means for supplying an electric current between said work and said cutting tool.

7. An apparatus for cutting metal comprising means for relatively moving work to be cut and the cutter cutting said work, means for electrically insulating one of said elements and means for supplying an electric current between said two elements for heating purposes.

8. An apparatus for cutting metal comprising means for holding work operated upon and a cutting tool operating on said work and means for drawing the result of said cutting away from said work and means for insulating said aforesaid means of drawing said cutting whereby an electric current may be made to pass through the cutting.

9. An apparatus for cutting metal comprising means for holding work operated upon and a cutting tool operating on said work and means for drawing the result of said cutting away from said work and means for insulating one of said means whereby an electric current may be made to pass through the cutting and means for passing an electric current through said cutting in sufficient amount to heat the same.

10. A cutting machine for metals comprising, a cutting tool, means for heating said cutting tool while the same is cutting metal, and means for relatively moving said cutting tool and said metal while in contact whereby said tool softens the metal and cuts a piece therefrom while so moving.

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