W. CLAY.

Turning-Tool for Metal.

No. 160,161. Patented Feb. 23, 1875

Fig: 1

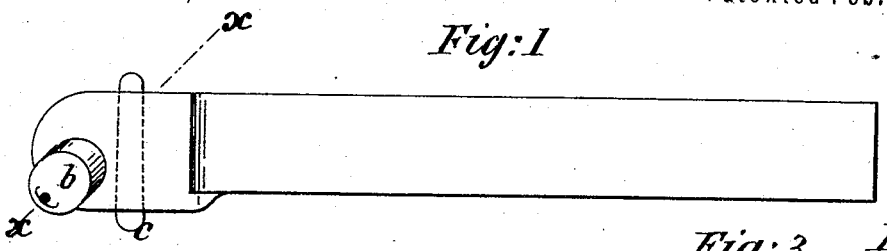


Fig: 3.

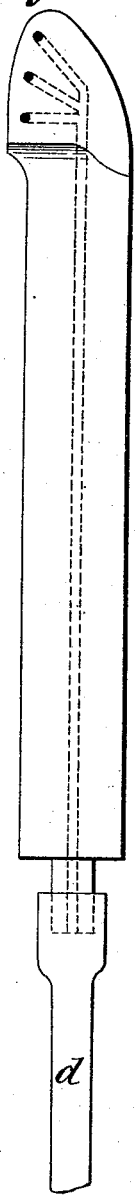


Fig: 4

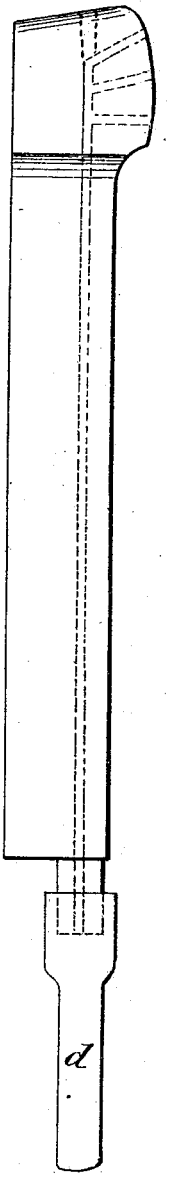


Fig: 2.

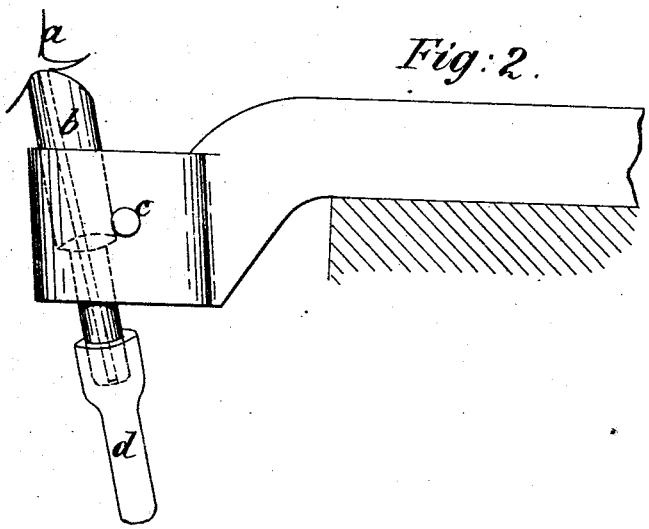
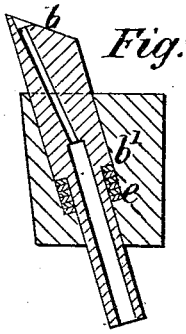


Fig: 5



Witnesses:
Michael Ryan
Fred. Haynes

Wm. Clay
by his Attorneys
Thomas & Allen

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

WILLIAM CLAY, OF BIRKENHEAD, ENGLAND.

IMPROVEMENT IN TURNING-TOOLS FOR METAL.

Specification forming part of Letters Patent No. **160,161**, dated February 23, 1875; application filed May 12, 1874.

To all whom it may concern:

Be it known that I, WILLIAM CLAY, of Birkenhead, in the county of Chester, England, iron-manufacturer, have invented certain Improvements in Tools for Cutting Metals, of which the following is a specification:

The object of my invention is to admit of the cutting and shaping machinery used for turning, planing, and otherwise cutting and shaping metals, being driven at a greater speed than heretofore, so that an increased amount of work may be obtained in a given time. This object is attained by keeping the cutting point or edge of the tool cool in a more effectual manner than has hitherto been done by merely dropping water onto the part of the article that is being operated upon.

In turning metals, (wrought-iron, for instance,) a slow drip of water is usually allowed to drop upon the metal shaving that is being turned off. A portion of this water afterward finds its way onto the tool in a tardy manner; but, the shaving being in the way, the water hardly ever finds its way to the precise cutting edge or point of the tool, and, therefore, considerable difficulty is experienced in keeping this cutting edge or point cool. The consequence of this is that the machine can only be driven at a very limited velocity; whereas, if the cutting edge or points were kept cool, the speed of the turning or cutting operation may be very considerably increased.

The object of my invention is, therefore, to keep the cutting-point of the tool cool; and this is effected by making the cutting-tool hollow, and then forcing a jet of water, steam, or current of air through the same, so as to impinge upon or near to the cutting point or edge of the tool, care being taken, as far as possible, to cause the water to strike between the cutting-tool and the shaving—that is to say, under the shaving that is being cut off the mass. By this means the frictional or other heat that is produced by the operation of the cutting-tool on the metal will be quickly carried off by the water or other cooling medium, so that the machine may be driven at increased speed, and a very considerable economy of labor and in artisans' wages will be the result.

The improvements may be carried out in various ways, depending upon the nature of the operation and the material to be operated upon.

In the accompanying drawing, Figure 1 is a plan, and Fig. 2 a side, view of my improved cutting-tool adapted to a lathe.

a is the piece of metal to be operated upon. *b* is one of my improved hollow cutting-tools, of which the point is shown in section at Fig. 5, on the line *x x* of Fig. 1. The tool is fixed in the usual manner, as shown in the drawing.

It will be seen that the tool *b* is bored out longitudinally, and to one end of it is adapted a flexible tube, *d*, made of india-rubber or other suitable material, and connected with a water-can, tank, or other water-supply, so that a jet of water may be made to pass along the inside of the cutting-tool and run over the cutting-edge thereof, between this cutting-edge and the shaving which is being removed from the mass *a*.

In order that the water should issue from the exit-opening with sufficient force and velocity, and in order, moreover, to avoid weakening the tool, the exit opening or openings (as there may be more than one) at the cutting end of the tool is or are contracted or made small, as shown in Fig. 5.

Fig. 3 is a plan view, and Fig. 4 is a side view, of another form of tool, in which the main water-channel is bored or otherwise made longitudinally right through the tool, and is plugged at the working end. The exit opening or openings for the passage of the water are then drilled or otherwise made in a diagonal direction into the main channel, so as to cause the water or other cooling medium to issue as near the cutting-edge as possible, and, after striking the under part of the shaving, to impinge on or flow over the cutting-edge of the tool.

Fig. 5 is a sectional elevation of one of my improved hollow cutting-tools, (such as that shown at Fig. 2,) fixed in an improved holder. The tool *b* is made with a shoulder, *b'*, the tail end of the tool being less in diameter than the forward end, and this shoulder *b'* rests on a corresponding shoulder made in the socket of the tool-holder, so that any possibility of

the tool being forced back in the holder will be effectually prevented. *c* is a pin or collar to hold the tool securely in the holder. When the cutting end of the tool has been worn down to such an extent as will render it necessary to raise up the tool in the holder, this can be effected by placing one or more washers, *e*, under the shoulder *b'*, as indicated in the drawing.

The water is supplied to the channel in the tool through a flexible pipe, *d*, as in the former instance.

It will be seen that the cutting-edge of the tool shown in Figs. 1 and 2 is circular, so that, as it wears or becomes blunt, it may be turned round in its socket, and thus present a fresh cutting-surface.

In cases where it will be inconvenient to use water as the cooling medium, I sometimes use a blast or current of air or steam, which will be made to impinge on, pass through, or flow over the heated working parts of the cutting-tools, and thereby carry off therefrom the heat, or a portion of the heat, generated by the friction of the tool on the surface to be operated upon. If desired, soap, soda, or other chemical substance may be mixed with the water for the purpose of assisting in lubricating the rubbing-surfaces or facilitating the cuting operation.

As most workshops have their own peculiarities in reference to the form and size of the cutting or shaping tools used therein, it will be impossible to describe every mode of carrying out the invention.

It will be evident that the form, arrangement, and mode of adapting my improvements may be variously modified without departing from the nature and object of my invention.

The arrangements above shown or described, as applied to lathes, will, however, be sufficient to set forth the principle upon which my invention is based, and any intelligent mechanic will be enabled to adapt the same to any planing or other shaping machine to which it may be applicable.

I am aware that a hollow turning-lathe cutting-tool is not new, such a tool being found described in Vol. 2, p. 535, of "Holtzapffel's Turning and Mechanical Manipulation;" but the hole in this tool was made with the view solely of facilitating the sharpening of it, to which end it was made as large as possible, conditional on a thickness of the surrounding wall, sufficient to withstand the strain put upon it, whereas the hole in my cutting-tool is for a widely different object—an object for which the tool described by Holtzapffel was not at all suggestive, to wit, to carry water or other fluid to the point of the tool underneath the shaving; and to this end the hole is made very small as compared with the diameter of the tool, and so located in the body of the tool and as near to the cutting-edge as a proper regard for the strength and durability of the cutting-point will permit.

Having now described my invention of improvements in tools for cutting and shaping metals, and in the means of keeping the same cool while in use, and having explained the manner of carrying the same into effect, I claim as my invention—

A tool for cutting or shaping metals, constructed substantially as described and represented, with a hole or passage through it for conducting water or other cooling fluid, gas, or vapor to the edge and beneath the shaving or cutting, substantially as specified.

Liverpool, the 28th January, 1874.

WILLIAM CLAY.

Witnesses:

CHAS. DEANE,
Solicitor, Liverpool, England.

J. SPIERS BAKER,
Notary Public, Liverpool, England.