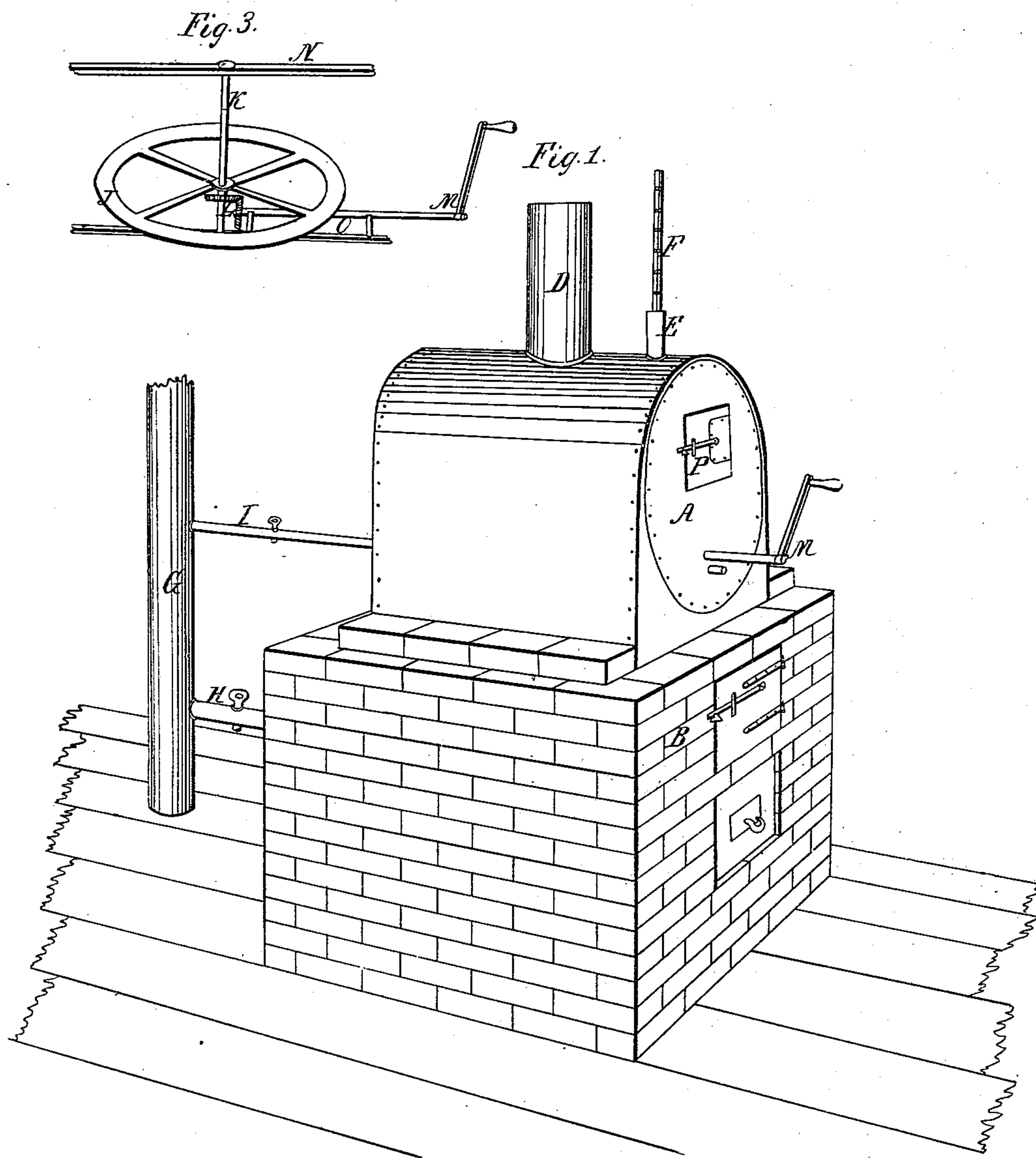


E. K. ROOT.
TEMPERING STEEL.

No. 2,995.

Patented Mar. 10, 1843.

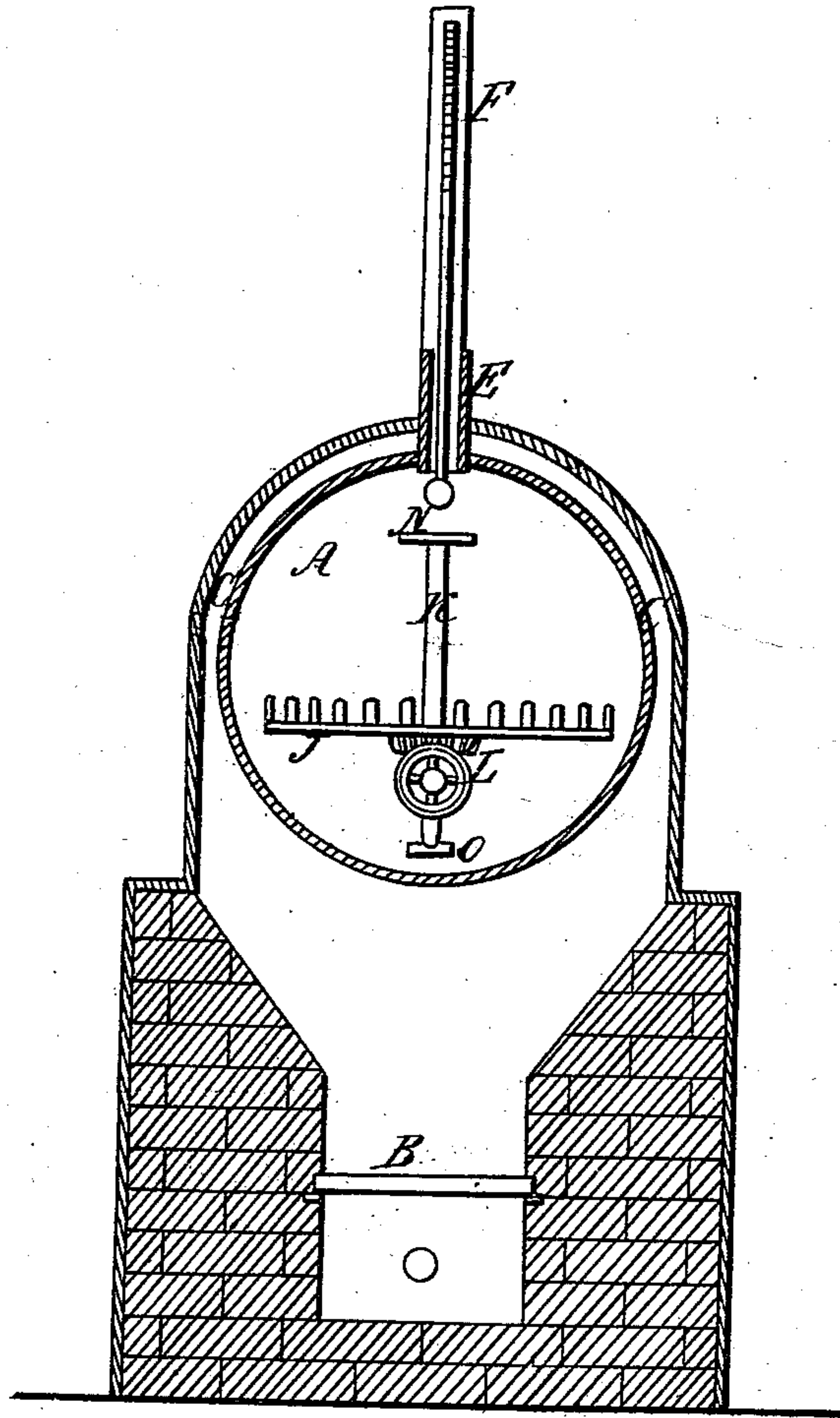


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Fig. 2.



UNITED STATES PATENT OFFICE.

ELISHA K. ROOT, OF COLLINSVILLE, CONNECTICUT, ASSIGNOR TO COLLINS MANUFACTURING COMPY.

TEMPERING STEEL.

Specification of Letters Patent No. 2,995, dated March 10, 1843.

To all whom it may concern:

Be it known that I, ELISHA K. ROOT, of Collinsville, in the county of Hartford and State of Connecticut, have invented a new and Improved Mode of Tempering Tools or other Articles Made of Steel or of Iron and Steel Combined; and I do hereby declare that the following is a full and exact description thereof.

10 My improved method of tempering articles manufactured, in whole or in part, of steel, consists in the placing them, and keeping them for a sufficient length of time, in an atmosphere, or bath, of heated air, which bath is to be brought up to, and kept at, the temperature required for the tempering, and which will vary according to the nature of the steel employed, and of tool, or other article, to be tempered:

20 To effect this object, I construct an oven, which may be formed of iron, or other material, and with this oven I combine a furnace and air-flues, so constructed and arranged as that the air contained in the oven may be as highly heated as is considered necessary, while its temperature can be regulated, by the introduction of cold air, at any time. For the purpose of ascertaining the temperature of the oven, I employ a thermometer, the bulb of which is to be exposed to the action of the air contained in the oven. The articles to be tempered may be placed on a carriage, or wheel, which may be made to revolve, or move, within the oven; by which the air will be in some degree agitated, and the articles to be operated upon will be made to occupy different parts of the oven. A device of this kind may not be absolutely necessary, but it is undoubtedly useful and convenient. The structure which I have erected, and which I am about to describe, is intended for the tempering of common, chopping axes, but will answer perfectly well for a variety of other articles; for various purposes, however, it may be found necessary to vary the particular structure of the oven, while the principle of action remains the same.

50 In the accompanying drawing, Figure 1, is a perspective view of an oven and furnace, which I have constructed. Fig. 2, is a vertical, cross section of it, in the line of the tube through which the thermometer passes; and Fig. 3, represents the manner in which I have arranged a horizontal wheel, upon

which the axes are to be placed within the oven, so that the whole may be made to revolve.

A, is the oven, which is to be heated by the furnace B, the heat from which passes through the flue space, C, C, surrounding said oven.

D, is the escape flue.

E, is a tube leading from the interior of the oven to the external air; and through this, a thermometer is passed in such manner as that its bulb shall indicate the temperature of the air within the oven.

F, is a thermometer placed within this tube.

G, is a blast pipe through which air is to be conveyed to the ash-pit of the furnace from any convenient blowing apparatus. From this, the tube H, leads into the ash pit, to supply the air necessary to combustion. I, is a tube leading, also, from the tube G, into the oven, and through which cold air can be blown when the temperature of the oven is to be reduced. The tubes H, and I, are furnished with stop cocks, to regulate the passage of air through them.

J, Fig. 3, is a horizontal wheel, fixed on an axis K, and made to revolve by means of bevel gearing, as shown at L, the axis and winch M, serving to communicate the desired motion.

N, and O, are bars placed within the oven, and made fast to its ends, to sustain the axis K.

When axes are to be tempered, I place them on their poles, around the wheel J, which may be furnished with projecting pins, to keep them in place. In the oven which I have essayed, the wheel J, is about twenty inches in diameter, and holds, conveniently, three dozen chopping axes, but the oven may be adapted to a much larger number. They are placed upon the wheel through the door-way P; after which, the door is closed, and the wheel is made to revolve slowly. There will be a perpetual current of air passing out through the tube E, which will cause the thermometer contained in it to show the exact temperature of the air within the oven. With the best cast-steel, I have found a temperature of 510° of Fahrenheit's scale to produce a perfectly good result in the tempering of axes; and the time required to bring them up to this degree of heat has been about forty

five minutes. Double, or treble, the number may be tempered in the same space of time, if the oven is sufficiently large. For smaller articles, less time will be required, and that
5 in proportion to their substance; no injury results from keeping the articles longer in the oven than is actually necessary, provided its temperature be maintained at the same degree; a thing in which there is not the
10 slightest difficulty, under the foregoing arrangement. It will be manifest, also, that the temperature of the oven may be graduated, so as to suit high, or low, steel, as well as to adapt it to the degree of hardness re-
15 quired in the articles operated upon. This process is entirely free from the uncertainty resulting from the test of color, so generally relied upon, and also from the varying fusibility of metallic alloys, which have
20 sometimes been used for tempering.

The oven, as I have described and represented it, is constructed of iron; and for those of a small size it may be best to make them of this material, but I intend to con-
25 struct them, also, in whole or in part, of brick, or of stone, which are bad conductors of heat; and to vary their form in any manner which I may find convenient and de-

sirable. If built entirely of bricks, or other bad conductors of heat, it may be found 30 advisable to allow heated air to be introduced within them, by means of air tubes passing through the furnace, as well as to provide the means of introducing cold air; this, and other changes in the arrangement 35 of the parts, may be made according to the choice, or judgment, of the constructor.

Having thus, fully described the nature of my invention, and shown the manner in which the same may be carried into practical 40 operation, what I claim therein as new, and desire to secure by Letters Patent, is—

The manner set forth of tempering articles formed of hardened steel, by the action of air heated to the required temperature, 45 within an oven, by means of a suitable furnace; which oven is provided with the means of ascertaining, and of graduating, the temperature, upon the principle, and substantially in the manner herein fully made 50 known.

ELISHA K. ROOT.

Witnesses:

THOS. P. JONES,
JOHN HITE.