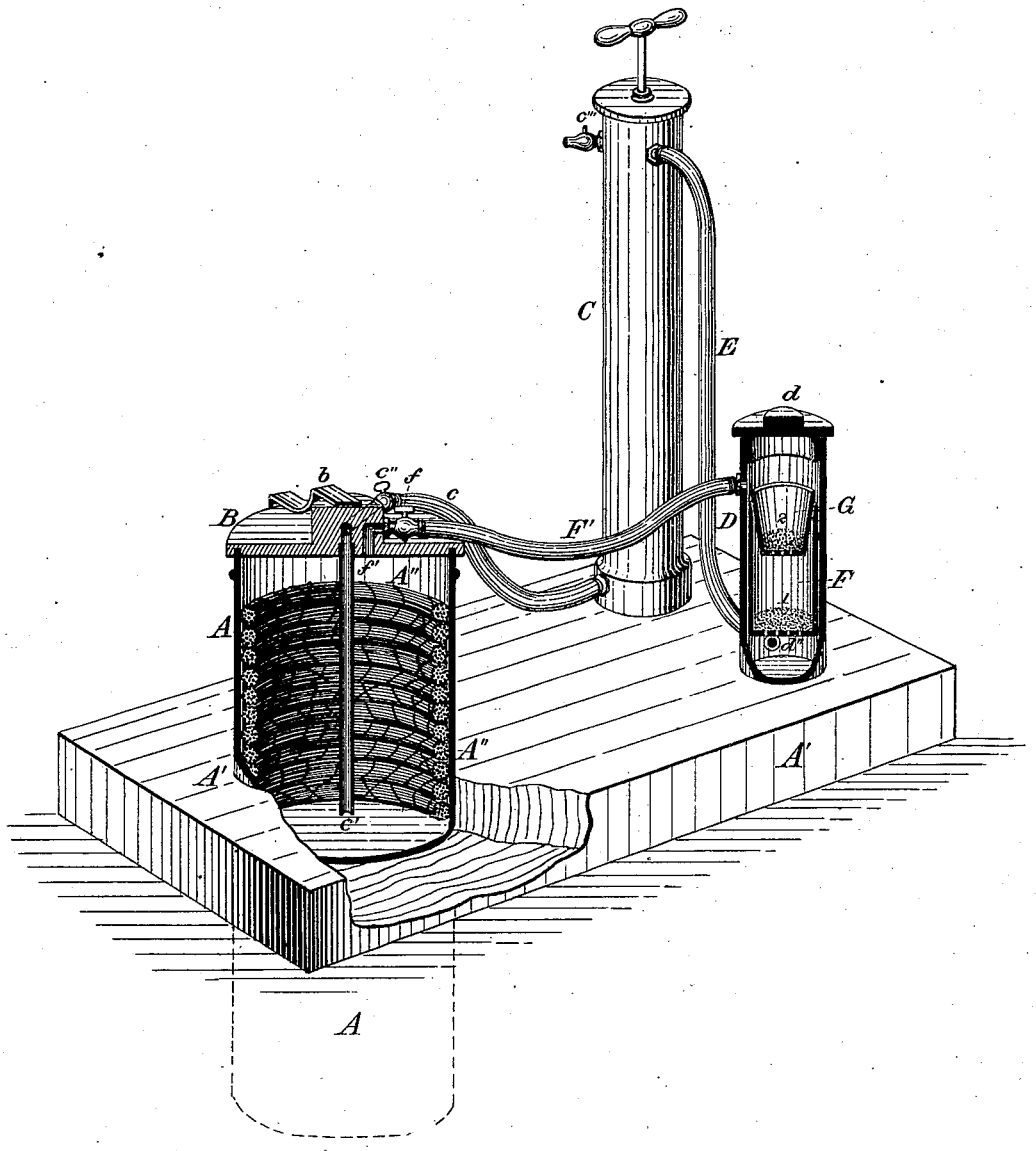
N. F. ENGLISH.

Annealing Wire.

No. 164,080. Patented June 8, 1875.



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN ANNEALING WIRE.

Specification forming part of Letters Patent No. **164,080**, dated June 8, 1875; application filed May 18, 1875.

To all whom it may concern:

Be it known that I, NATHAN F. ENGLISH, of Hartland, in the county of Windsor, in the State of Vermont, have made certain Improvements in the Process of Manufacturing Wire, of which the following is a specification:

In the ordinary process of manufacturing wire by the operation of drawing the wire to reduce its diameter, it is usual to heat the rod from which wire is to be drawn, or the wire itself, to a bright red heat, and allow it to cool slowly, in order to make the rod or wire have the necessary degree of softness or ductility to allow it to be drawn to a less diameter in a subsequent operation. This is called annealing, which is usually effected by placing the rods or the wire, once drawn, into closely-covered pots, tubes, furnaces, or retorts, heated externally, to give the rods or wire the proper degree of heat. These receptacles, although closed, will permit more or less air to be present; and, as a consequence of this process of annealing, the rod or wire becomes coated with a thin skin, or scale, or oxide, which prevents the possibility of its being, in that condition, drawn out into finer wire, or wire of less diameter, without first removing this skin, scale, or oxide, which is usually done by means of diluted acids applied to the surface of the wire, and then washing off the acid. The application of acids has the effect of making the metal brittle or rotten, as it acts upon the metal unevenly in removing the scale, and hence reduces the size of the rod or wire. After the scale or oxide is thus removed and the wire dried it is ready for being drawn again to reduce its diameter, by the wide-known means in use.

In practice, it is found that after having passed through two, or at most three, holes, the metal of which the wire is drawn becomes hardened, and cannot be further reduced in diameter without risk of breaking it, and the process of annealing or softening has had to be resorted to again, when another scale or oxide is formed on the wire, which has to be removed, as above described; and the finer the wire is to be the greater the number of times this operation has to be repeated, and the finer it becomes the more detrimental is the action of the acid upon its quality.

The object of this invention is to avoid all the disadvantages above described in applying acids, and the great number of operations necessary to reduce wire to its desired degree of fineness, by preventing oxidation or scale upon the wire while being annealed; consequently no scale will have to be removed, nor is there any danger of affecting the quality of the wire by the application of acids, and the great labor of cleaning the wire after applying the acid is wholly avoided; and it consists in the means for effecting the object, as will be fully hereinafter described.

The drawing shows my device in perspective and partly in section, in which—

A represents a closed retort or receptacle of suitable material, to be heated in the usual manner, and to the degree of heat necessary to heat the wire or wire-stock A″ that is placed inside to the proper degree of heat for drawing, and it is sustained in and by the supporting-floor A′, and extends far enough below the floor to apply successfully the external heat to the wire or wire-stock A″ inside of the retort, to be heated to a red heat. B is the removable cap or cover to the retort A, is made to closely fit upon the top of the retort, so as to form an air-tight joint, and is secured in its position on the retort by a keeper, *b*, or any other safe and secure way, and in such manner as to be easily and quickly removed. C is an air-pump, of the usual construction, and having a tube or pipe, *c*, fixed near the bottom of the pump-stock, and extending to the cover of the retort, and there connecting with a perpendicular and central pipe, *c′*, that extends to near the bottom of the retort, with its lower end open and free. *c″* is a cock, in pipe or tube *c*, that can be turned to stop off the circulation between the pump and retort. *c‴* is a vent-cock, near the top of the pump. D is a cylindrical holder, secured upon the floor A′, and is connected with the pump by the pipe E, that comes from near the top of the pump, and enters the holder near the bottom at *d′*, and is closed by an air-tight cover, *d*. F is a removable vessel, within the holder

D, and has perforations in its bottom to admit air from pipe E, that comes under it through opening *d'*. This vessel is made to fit air-tight at its top within the holder D, by any suitable means. In this vessel is a suitable quantity of live or quick lime, 1. G is another vessel at the upper end of F, and has perforations in its bottom, and is to be air-tight at its upper end, where it is inserted into the upper end of F, is made tapering or smaller at its bottom, so as to be readily removed when necessary. This vessel contains a suitable quantity of metallic sodium, 2. F' is a tube or pipe extending from holder D, and above vessel G, to the cap B of retort A, and thence downward through the cap into the retort, at *f'*. *f* is a stop-cock in pipe F', to cut off connection between the holder D and retort A when necessary.

The retort being supplied with its charge of wire-stock or wire, and heat applied to the retort to heat the wire to a red heat, the pump C can be used to relieve the retort of the air it contains by leaving vent *c'''* open; and when it is necessary to force air into the retort by the pump, vent *c'''* is closed and stop-cock *f* in pipe F' opened, when the air is forced by the pump through pipe E into holder D, up through the quicklime 1 in vessel F; thence up through the sodium 2 in vessel G; thence through pipe F' to opening *f'* in the bottom of the cup into the top of the retort.

If it is desired to exhaust any portion of the air from the retort, stop-cock *c''* and vent-cock *c'''* are opened, and stop-cock *f* closed. Then, by working the pump C, the air in the retort will be pumped out.

When a circulation through the retort is effected vent-cock *c'''* is closed, and stop-cock *c''* in pipe *c* and stop-cock *f* in pipe F' are opened; then, by working the pump C, the air from the bottom of the retort will be drawn upward, through pipe *c'*, through pipe *c*, through the pump and pipe E, into the holder D, at opening *d'*, near the bottom; thence up through vessel F and quicklime 1; then through the metallic sodium 2 in vessel G, into pipe F'; thence through pipe F' and cover B into the top of the retort at opening *f'*.

Thus a complete circulation is kept up while the wire is being annealed and cooled in the retort, and the air passing first through the quicklime in vessel F to remove or dissipate the moisture, then through the sodium in vessel G, which deprives it of all or nearly all of its oxygen, only nitrogen remaining, thus preventing the accumulation of scale or oxide upon the surface of the wire; and when the wire is cooled it is ready for a repetition of the operation of drawing without any intermediate process of applying acid, pickling, or washing and drying, which effects a great saving in time and expense, as well as avoiding the injury to the wire by the application of acid.

Other substances than sodium may be used to deprive the air of its oxygen, such as potassium or magnesium; but I prefer sodium, as being cheaper and quicker in its effects.

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

1. The combination, with the retort A, for annealing wire, of the central pipe *c'*, pipe *c*, and pump C having vent-cock *c'''*, substantially as and for the purposes described.

2. The combination of the retort A, central pipe *c'*, pipe *c*, and pump C, with pipe E, holder D, and vessels F and G and their contents, pipe F', opening *f'* in the cap of the retort A, whereby a continuous circulation is had by taking the air from the bottom of the retort and supplying its place at the top of the retort, substantially as described.

3. The process above described of preventing scale or oxide on wire in annealing and cooling it, by exhausting the air in the retort and causing it to be circulated first through quicklime, then through sodium, before it is forced into the retort, substantially as described.

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Witnesses:
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