UNITED STATES PATENT OFFICE.

DAVID M. SMITH, OF SPRINGFIELD, VERMONT.

METHOD OF PRESERVING THE SHAPE OF STEEL SPRINGS IN THE PROCESS OF TEMPERING.

Specification forming part of Letters Patent No. **5,979**, dated December 19, 1848.

To all whom it may concern:

Be it known that I, DAVID M. SMITH, of Springfield, in the county of Windsor and State of Vermont, have invented a new and useful process of restoring the shape of flat hard curved steel springs which have become warped or twisted out of shape during the operation of tempering the same; and I do hereby declare that my invention is fully described and represented in the following specification.

It is a fact well known to persons experienced in tempering steel springs (made of steel strips or bands of steel) that they often warp or bend out of shape during the tempering process, and that after such occurs it is very difficult to restore them to their original or proper shape. The method which I adopt for restoring such a spring after it has been hardened and its temper drawn in the usual way consists in confining it upon and to a metallic or other suitable pattern or mold of the shape which it is desirable the spring shall receive, and plunging the pattern and spring confined upon it into molten lead or some metallic or mineral substitute in a state of fusion or in a fluid state, and heated to a high and proper temperature. For example, suppose it is desirable to restore a truss-spring or abdominal-supporter hip-spring to the shape which it should have previous to being applied to the body. Such a spring is generally made out of a thin strip of steel, bent so as to spring and fit closely around the loins or that part of the body immediately above one of the hips. I prepare an iron pattern or mold with an external surface of a shape to correspond with that I desire to give to the internal surface of the strip of steel which is to be placed upon it. This being done, I lay the said steel strip upon said surface, and bend it and make it fit down closely upon the said surface, and by means of any suitable clamps or contrivances I confine the strip, at its end or elsewhere, as the case may require, down upon said surface. I do not consider it necessary that a metallic pattern or shape should always be used, as said pattern or shape may be made of any suitable material capable of withstanding a high degree of heat, or that degree of heat to which it may be subjected. The pattern and article affixed upon it is next to be plunged into a mass or bath of melted lead or other proper metal or combination of metals in a fused or melted state, and there suffered to remain a minute, more or less, as occasion may require. When removed from the heated metal and from the pattern the spring will be found set into the shape of the surface of the pattern against which it has been made to rest during the operation.

I am aware that it has not only been customary to harden certain kinds of steel springs when fixed on a mold, but to afterward draw the temper of such while so fixed on a mold. Such process, however, I consider to differ essentially from my mode of hardening and tempering a spring and restoring or preserving its shape after it has been tempered. Springs such as are used in trusses or abdominal supporters—that is, hip or body springs—and which are made of thin and flat bands or strips of steel, cannot be hardened on a mold without serious danger of being broken during the process. When such springs are attempted to be so hardened they will break in a majority of cases, the cause of their breaking being in consequence of the water into which they are plunged having access to but one side of them, as it were. That side of the spring which is bound closely in contact with the mold is not cooled so fast as the opposite side, for from various causes the water cannot get access to it as quickly as it does to the opposite side. It is a well-known fact that the external surface of a heated piece of metal is that part of it which is cooled first during the process of hardening or dipping it into a cold-water bath. When a flat spring is bound close against a mold its external surface will cool quicker than the internal surface of it, or that which is in contact with the mold, for the heat of the mold itself is one cause which prevents the inner surface of the spring from cooling so quickly as the outer surface thereof. The unequal reduction of temperature of the surfaces of the spring is the cause, or one prominent cause, of rupture. Thus it will be seen that, although some kinds of springs (particularly those made of round steel) can be hardened on a mold, there are others—viz., those made of flat and thin steel—which cannot be so hardened without great danger of being broken during the process.

In making a spring of a flat band or strip of steel I bring it to about the shape required, and next harden it in the usual way and not on a mold. I next draw the temper to the extent required to enable me to bend it, and apply it

to the mold without danger of breaking it while applying it and clamping it to the mold. This being accomplished, I afterward plunge the mold and spring into the bath of metal, as hereinbefore described, and by so doing I preserve the shape of the spring which was given to it by the mold. It must be borne in mind that, although I could bend the spring so as to make it fit to the mold, yet the elasticity of the spring would or might, if the spring was removed from the mold before being dipped in the bath, cause it to take a somewhat different shape. The dipping the mold and spring together into the bath preserves the shape of the latter. Therefore I wish it understood that I lay no claim to the process of hardening a spring on a mold and drawing the temper while on the mold; but

That which I do claim, and as particularly applicable to the manufacture of curved flat springs for trusses or various other articles, is—

The improved process above detailed or described, the same consisting, first, in hardening the spring in the usual manner when off the mold; second, in drawing the temper (it being still off the mold) to such extent as to enable me to apply it to the mold without danger of breaking it while so doing; third, in clamping said spring to a mold and plunging it and the mold so clamped together into a bath of melted lead or other suitable metal or metals or material or materials in a fluid state, and raised to the temperature necessary to produce the desired effect of preserving the shape of the spring or that given to it by the mold.

In testimony whereof I have hereto set my signature this 29th day of November, A. D. 1848.

DAVID M. SMITH.

Witnesses:

R. H. EDDY,

JACOB EDSON.