

Jan. 1, 1952

W. E. LEONARD

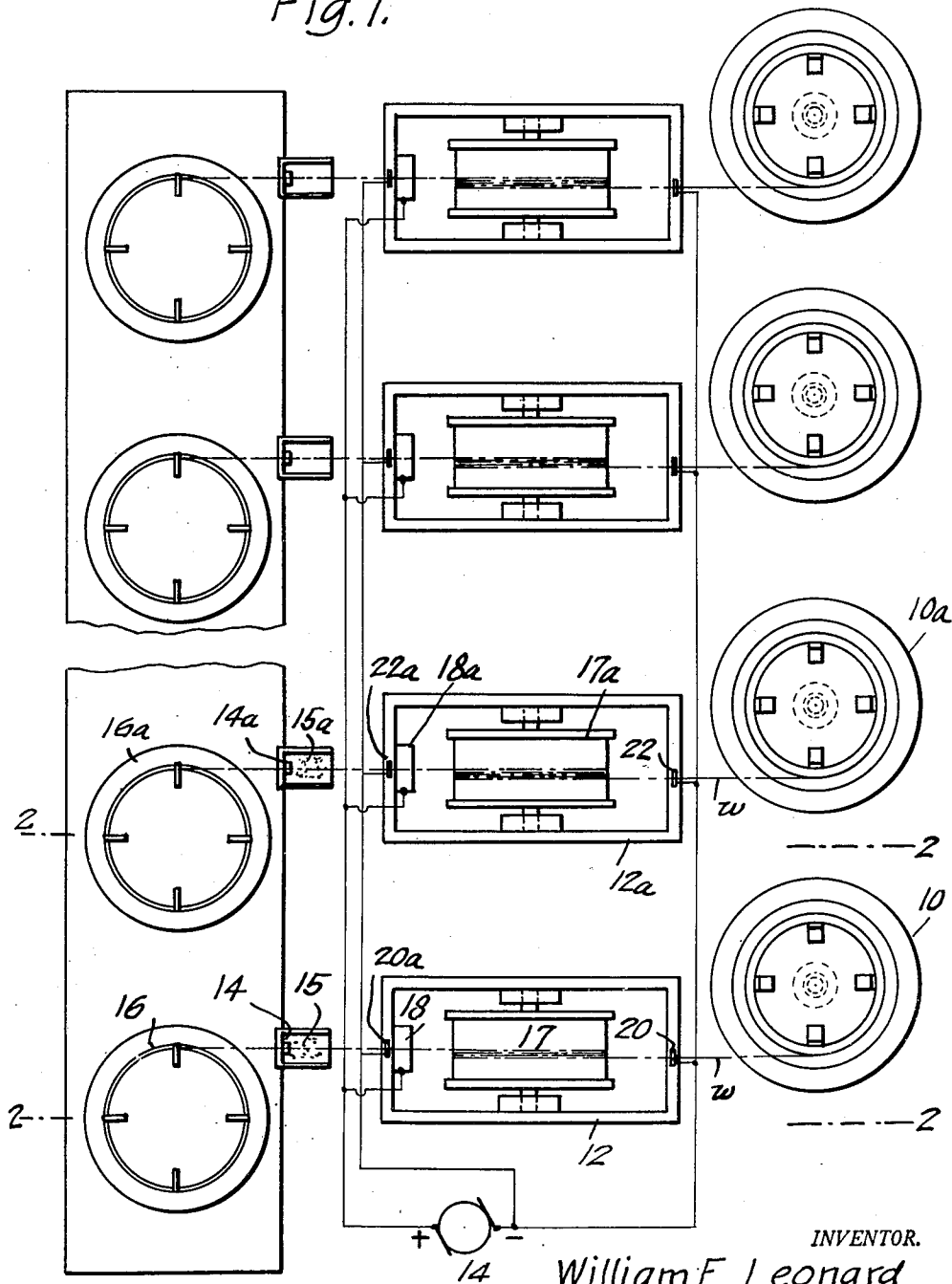
2,580,801

METHOD OF MAKING LUSTROUS STEEL MUSIC WIRE

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3 Sheets-Sheet 1

Fig. 1.



INVENTOR.

William E. Leonard

BY

Kenneth S. Keaton

Jan 1, 1952

W. E. LEONARD

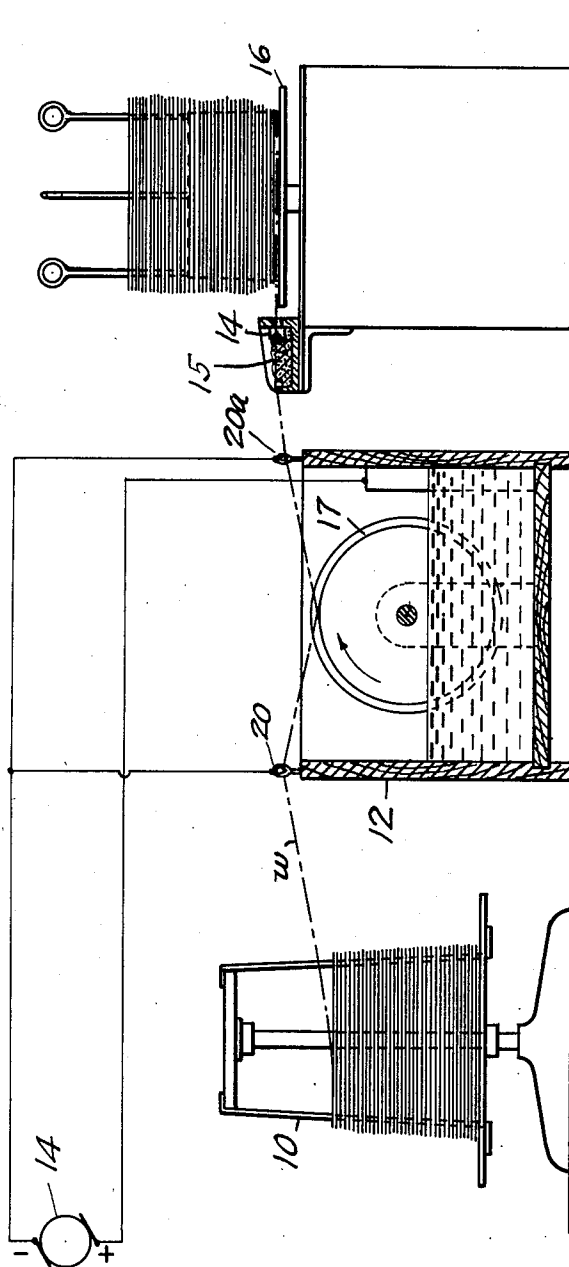
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Fig. 2.



INVENTOR.

William E. Leonard

BY

Thomas S. Keaton

Jan. 1, 1952

W. E. LEONARD

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Fig. 3.

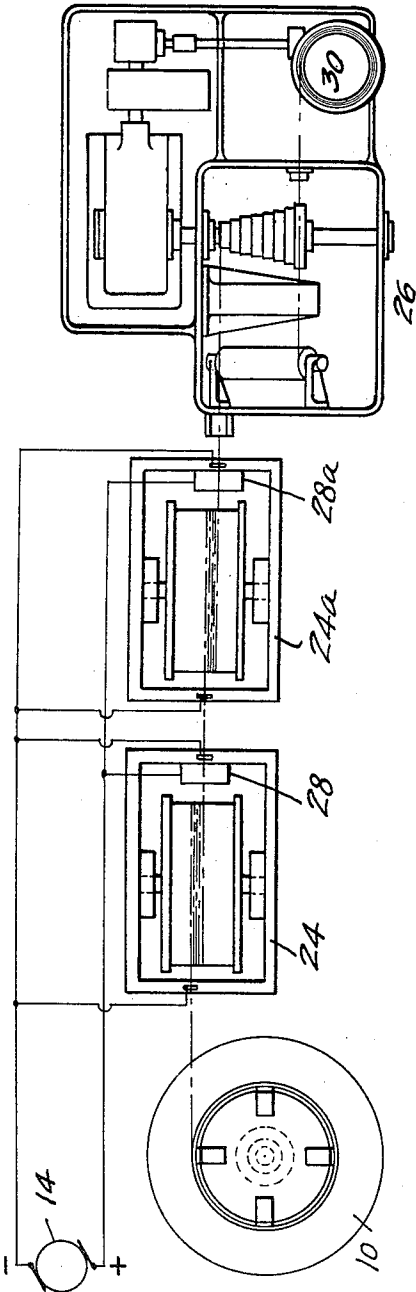
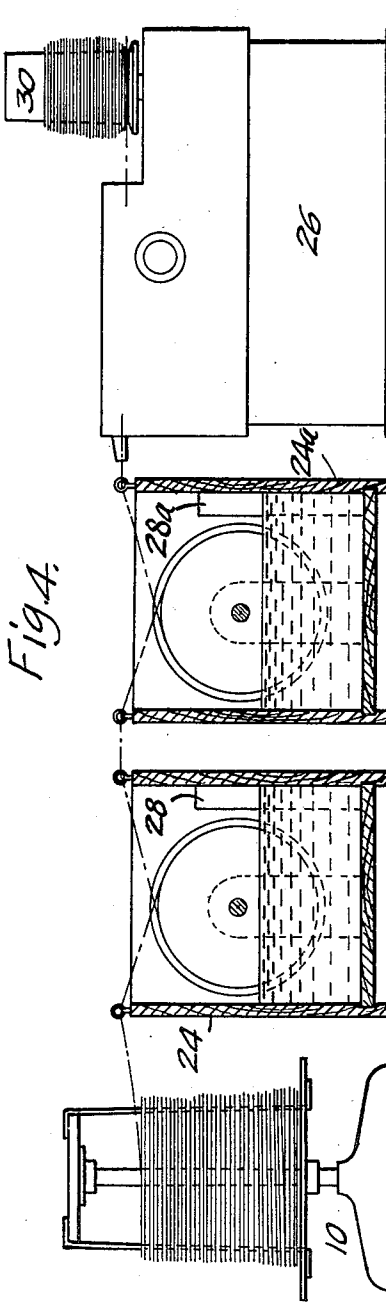


Fig. 4.



INVENTOR.

William E. Leonard

BY

Thomas S. Keaton

UNITED STATES PATENT OFFICE

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METHOD OF MAKING LUSTROUS STEEL
MUSIC WIREWilliam E. Leonard, Worcester, Mass., assignor to
The American Steel and Wire Company of New
Jersey, a corporation of New Jersey

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2 Claims. (Cl. 204—28)

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This invention relates to improvements in wire drawing and provides a novel procedure which makes possible the mass production of smooth bright finish wire having an exceptionally high luster. While not limited thereto, the method is peculiarly well suited for the manufacture of music wire.

Heretofore, music wire made according to conventional prior practice has required costly and time consuming special cleaning usually accomplished by immersing coils or bundles of ferrous wire in sulphuric or hydrochloric acid and then dipping at the cleaning crane into a vat containing tin sulphate or copper sulphate or a combination of them thereby chemically coating the ferrous stock with a film or layer of a dissimilar metal. Such chemically cleaned and metallic coated wire was then taken to the wire drawing room and wet drawn 7 drafts continuously from .030" to .015" in diameter.

This .015" diameter wire was then taken to the cleaning house again and a metallic coating again applied by dipping the coils of wire in the metallic coating solution as referred to above.

Thereafter, the wire was taken to the wire drawing room where it was again drawn 7 drafts continuously from .015" to .008" in diameter which was the finished size. In these continuous wet-drawing steps, the usual soap lubricant was used and the wire was drawn at a speed of about 240 feet per minute. The finished wire made according to the conventional practice above described lacks the smooth, white and lustrous coating obtained on wire when it is treated and drawn by the new process hereinafter disclosed and claimed.

My improved method will be apparent from the following detailed disclosure and the appended claims when read in connection with the accompanying drawings in which:

Figure 1 is a plan of a layout of apparatus for carrying out the invention.

Figure 2 may be considered as a sectional elevation taken on either of lines 2—2 shown on Figure 1.

Figures 3 and 4 are respectively a plan and sectional elevation illustrating a modification of the method.

Referring in detail to the preferred method as illustrated in Figures 1 and 2, I start with a wire that has been drawn dry on continuous machines from the hot rolled rod, to a process size which may be approximately 2 drafts from the finished size in which the wire is to be sold to the customer. Such a dry-drawn wire, for example, may vary from .0305" to .070" in diameter and even

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larger depending on the finished size of wire desired. This dry-drawn wire has on its surface the soap and lime lubricant used in the drawing process.

This wire *w* is placed on a floor reel 10 and passed from there into an electroplating tub 12, as shown in Figures 1 and 2, in which the wire is made the cathode in an electroplating circuit. The electric current is supplied by a generator 14 as indicated or from any other conventional plating current source.

From the electroplating tub 12 the wire is passed through a wire drawing die 14 using a paste type of lubricant 15, after which it is wound up on a block 16 driven by any suitable or conventional power means. The wire thus treated and drawn has a bright luster, but not as bright and lustrous as desired.

In view of the fact that the wire produced by the above treatment does not have the desired brightness and luster, this drawn wire is given a further electrolytic treatment as set forth in steps recited below.

The wire from the block 16 is placed on the floor reel 10a and passed into a tub 12a in which the wire is again made the cathode in the electroplating circuit powered, for example, by the generator as diagrammatically shown. The electrolyte contained in the two tubs 12 and 12a may be the same kind, for example, H_2SO_4 of a concentration of approximately 2% to 4% by volume, but that contained in tub 12a is cleaner since the electrolytic action taking place in the first tub 12 effects a cleaning off of some of the lime and other lubricating substances carried over on the wire from its initial drawing treatments.

From the second tub 12a, the wire is given a draft through a die 14a using a paste lubricant 15a after which it is wound up on a second block 16a driven by any suitable power drive. Metal anodes 18 and 18a, for example, of pig tin are suitably supported in the tubs, respectively. The electroplating circuit in each tub is such that the wire *w* in process is maintained as a cathode and the metal from the anode is electrolytically deposited on the continuously advancing wire while it is enroute to the wire drawing blocks 16 and 16a.

In practice it has been found advantageous to connect the electric circuit to the cathode wire in two places, one where the wire enters the tub and the other where it leaves the tub. The electric connection can conveniently be made by securing the conductor leads to the metal guide

eyes 20 and 20a and 22, 22a as shown. The wire under treatment makes several wraps around spools 17 and 17a which are rotatably supported in the tubs as shown.

In the modification illustrated in Figures 3 and 4, the starting material is patented wire which therefore has no lubricant on it whatsoever, that having been burnt off by the heat of the patenting furnace. In this modified process, the patented wire is passed through two electroplating tubs 24 an 24a arranged in tandem as shown and the process differs slightly from that of Figures 1 and 2 in that, in this modification of Figures 3 and 4 there is no wire drawing step between the two electroplating steps and in the latter modification the wire is subjected to multiple drafts in a continuous wet wire drawing machine 26 which may be considered as a conventional wet wire drawing apparatus effective to subject the wire from 6 to 14 drafts or reductions in sectional area. In this modification, the wire while in process of being drawn is also maintained as a cathode in the electroplating circuit and thus has metal from the tin anodes 28 and 28a electroplated thereon while enroute to the ultimate take-up block 30.

While the amount of tin deposited on the wire in ounces per square foot is very small, it is nevertheless sufficient to impart to the wire a smooth bright whitish finish of high luster required for so-called music wire such as used for pianos and various other types of stringed instruments.

While the method has been demonstrated to be of great utility in the production of music wire, it is also used in the manufacture of reed wire and stapling wire which is generally low-carbon .10 to .16 carbon as well as for other high-carbon wire, such as heddle wire, needle wire, safety pin wire and the like which generally have a carbon content from .65 to .90.

Both examples of the treatment described involve the steps of cathodically treating the wire by passing it successively through two dilute acid electrolytic baths containing metallic ions and subjecting the thus cleaned and plated wire to, at least, one draft through a wire drawing die whereby the combined action of the steps produces a greatly improved drawn electroplated smooth wire having a highly lustrous finish far superior than that attainable by prior known methods.

As a result of the adoption and use of the herein claimed novel process a uniform color and finish are now being obtained on all wire produced in the department under my supervision and no rejection is now being experienced whereas formerly, rejections went as high as 50% and over. Thus my new process makes possible a considerable increase in production and accordingly, constitutes an important economic advance in the art. Among other new and improved results that are made available by the present invention are the following:

a. It has eliminated the step of cleansing and coating the wire previously performed in the cleaning house at the cleaning crane. The wire drawer simply is required to make up, at the wire drawing bench, his tubs of acid and water solution which he does once every one or two weeks depending upon whether the tub is the first tub or the second tub. The electrolyte in the first tub generally becomes contaminated with the sludge which comes from the lubricant and lime on the wire so that it has to be dumped once a week.

The electrolyte in the second tub becomes less contaminated and only needs to be dumped every two weeks. This indicates that the treatment in the first tub is principally electrolytic cleaning accompanied by some electrodeposition while the treatment in the second tub is principally electrodeposition with some secondary cleaning. The plant electrician places the metal anodes in the electroplating tubs and connects the circuits as shown, so that the wire drawer does not have to concern himself about that part of the apparatus. This saving in cleaning cost in the cleaning house is very substantial.

b. An increased die life has resulted. The wire drawer does not have to go to the storekeeper for new dies as often as he did before. This has been particularly noticed by the die-tool man who has a smaller number of replacements and repairing or redrilling of wire drawing dies. I ascribe this improvement in die life to the fact that the wire is cleaner as it goes into the die than was the case by the old prior art practice.

c. There has been a very marked increase in the total production of music wire. No time is now required by the wire drawer in preparing the coils of wire on the floor rees which are to be drawn. Wire cleaned and coated by the conventional practice often came to the wire drawer in a snarled condition which required the wire drawer to spend about three-quarters of an hour each day to straighten it out. It has been found that the music wire production has been practically doubled. By the new method, production in the music wire department has been increased to an amount greater than could be handled by the existing cleaning equipment for music wire.

d. By the new practice, there is now being obtained twice as much good wire as previously. Wire produced by the old conventional practice of batch cleaning and batch coating and then drawing often had to be returned to the cleaning house to be recoated so that it thereafter could be drawn to the proper color and finish. While the wire could be drawn to the required size, and tensile strength, generally that was done at the expense of the finish so that, therefore, it frequently had to be sent back to be metallic coated again and then drawn to obtain the required finish. By the new practice, as herein claimed, none of the wire produced is rejected nor has it been required to be sent back to be metallic coated again to obtain the required finish.

e. The labor conditions have been improved. The wire drawer has less physical labor in treating and drawing the wire than he had when he used the old conventional practice. By that old practice, each wire drawer was required to immerse coils of wire to be drawn in his metallic coating tub. This was done by means of hooks which he held in his hands to dip or swish the coils in the metallic coating solution in order to coat the wire. None of that laborious immersion treatment is now required.

f. There is also a saving in the hot tinning operation where this is necessary as a final operation to meet customers' requirements. In that case, the liquor-finished wire as made heretofore was taken to another department for coating by the hot-tinning process. With the conventional practice of producing liquor-finished wire, it was impossible to avoid, as an inevitable result of the chemical deposition, some copper color in the finish. When the wire was taken to the hot-tinning department and a coating of tin was applied,

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the wire had to be passed through the tinning bath twice in order to prevent the copper color of the original metallic coating thereon from showing through the tin coating.

By the present improved practice where a white, smooth and lustrous finish is obtained, when that wire is to be coated with another coating of tin by the hot tinning process, it is only necessary to pass it through the tinning bath once in order to produce the desired color. It is not necessary to pass it through twice as was heretofore required.

While in the foregoing, I have described features which have been demonstrated by an actual reduction to practice to be highly desirable, it is to be understood that the drawings and description are to be construed in an illustrative sense and that various modifications may be made without departing from the scope of the invention as defined in the appended claims.

I claim:

1. In a method of making lustrous steel music wire, the steps including drawing steel wire rod dry through dies, thereby reducing it to a size at least two drafts larger than the desired finished size, i. e., between .0305" and .070" in diameter, then passing the wire around a drum at least partly immersed in a first dilute sulphuric acid bath of approximately 2 to 4% concentration containing a tin anode, maintaining the wire on the drum as the cathode in a circuit including said bath, said anode and a current source, thereby effecting principally an electrolytic cleaning of the wire accompanied by some electrodeposition of tin on the wire, drawing the coated wire through a die and thereby reducing it to smaller size and smoothing the coating, then passing the wire around a drum at least partly immersed in a second dilute sulphuric acid bath of approximately 2 to 4% concentration separate

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from the first and containing a tin anode, maintaining the wire on the second-mentioned drum as the cathode in a circuit including said second bath, the anode therein and a current source, thereby effecting principally the electrodeposition of a final continuous tin coating on the wire, and then drawing the wire through a die having a hole smaller than that of said first-mentioned die thereby reducing it to finished size and increasing the luster of its surface.

2. The method defined by claim 1 characterized by winding the wire on a drawing block after its passage through each die.

WILLIAM E. LEONARD.

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