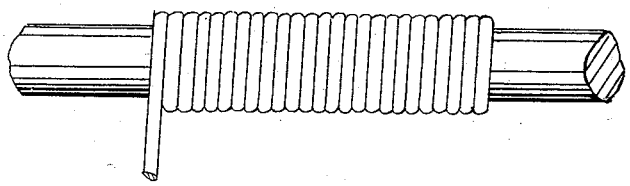
(Model.)

M. S. LUDWIG.

PIANO FORTE STRING.

No. 303,651. Patented Aug. 19, 1884.



WITNESSES

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UNITED STATES PATENT OFFICE.

MAHLON S. LUDWIG, OF PHILADELPHIA, PENNSYLVANIA.

PIANO-FORTE STRING.

SPECIFICATION forming part of Letters Patent No. 303,651, dated August 19, 1884.

Application filed November 22, 1883. (Model.)

To all whom it may concern:

Be it known that I, M. S. LUDWIG, a citizen of the United States, residing at No. 1019 Arch street, Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Piano-Forte Strings, of which the following is a specification.

This invention consists in a piano-forte string upon which have been successively electro-deposited copper, aluminum, and gold.

It is well known that gold has been deposited upon piano-strings, and also that an alloy of aluminum and gold has been so applied; but the successive deposition of the three metals—copper, aluminum, and gold—has never before been resorted to.

The drawing accompanying this specification represents on an exaggerated scale the ordinary steel string closely wrapped with steel or copper wire.

Copper, as is well known to all electro-depositors, adheres more firmly and durably to steel than any other metal, and it therefore forms a better foundation for the deposition of aluminum and subsequently of gold. The majority of piano-strings are covered or bound with steel wire; but some few are covered with copper wire, in which latter case the deposition of copper may be omitted and the aluminum and gold only successively deposited. The deposit of aluminum on the copper, then, materially alters the tone by rendering it (the string) more voluble, and finally the gold deposit renders the tone more resonant, and at the same time is a protective against oxidation from atmospheric causes. I propose to submit all strings or parts of strings in a piano-forte, whether covered or not, to these successive depositions, as they not only improve the tone, but render them proof against oxidation.

For the deposition of copper I use a solution composed of carbonate of potassa, four (4) ounces; sulphate of copper, three and a half ($3\frac{1}{2}$) ounces; liquid ammonia, two (2) ounces; cyanide of potassium, about eight (8) ounces; water, one (1) gallon. For the deposition of aluminum I use a solution of chloride of aluminum with a very weak battery-power. For the deposition of gold I use an ordinary solution of cyanide of gold and potassium of the strength of six (6) pennyweights to the gallon. Any of the ordinary methods known to depositors, if used with judgment, will answer. The strings thus coated are subjected to a process known as "sclatch-brushing" after each deposition, by which the copper is burnished into the steel, the aluminum into the copper, and the gold into the aluminum, thus incorporating the several metals with each other.

What I claim as new, and desire to secure by Letters Patent, is—

A piano-forte string having a coating of copper, aluminum, and gold, which have been separately and successively deposited thereon, substantially as and for the purposes specified.

In testimony whereof I affix my signature in presence of two witnesses.

MAHLON S. LUDWIG.

Witnesses:

JOHN MCLINTOCK,

PERCIVAL THORNTON.