No. 676,106. Patented June 11, 1901.

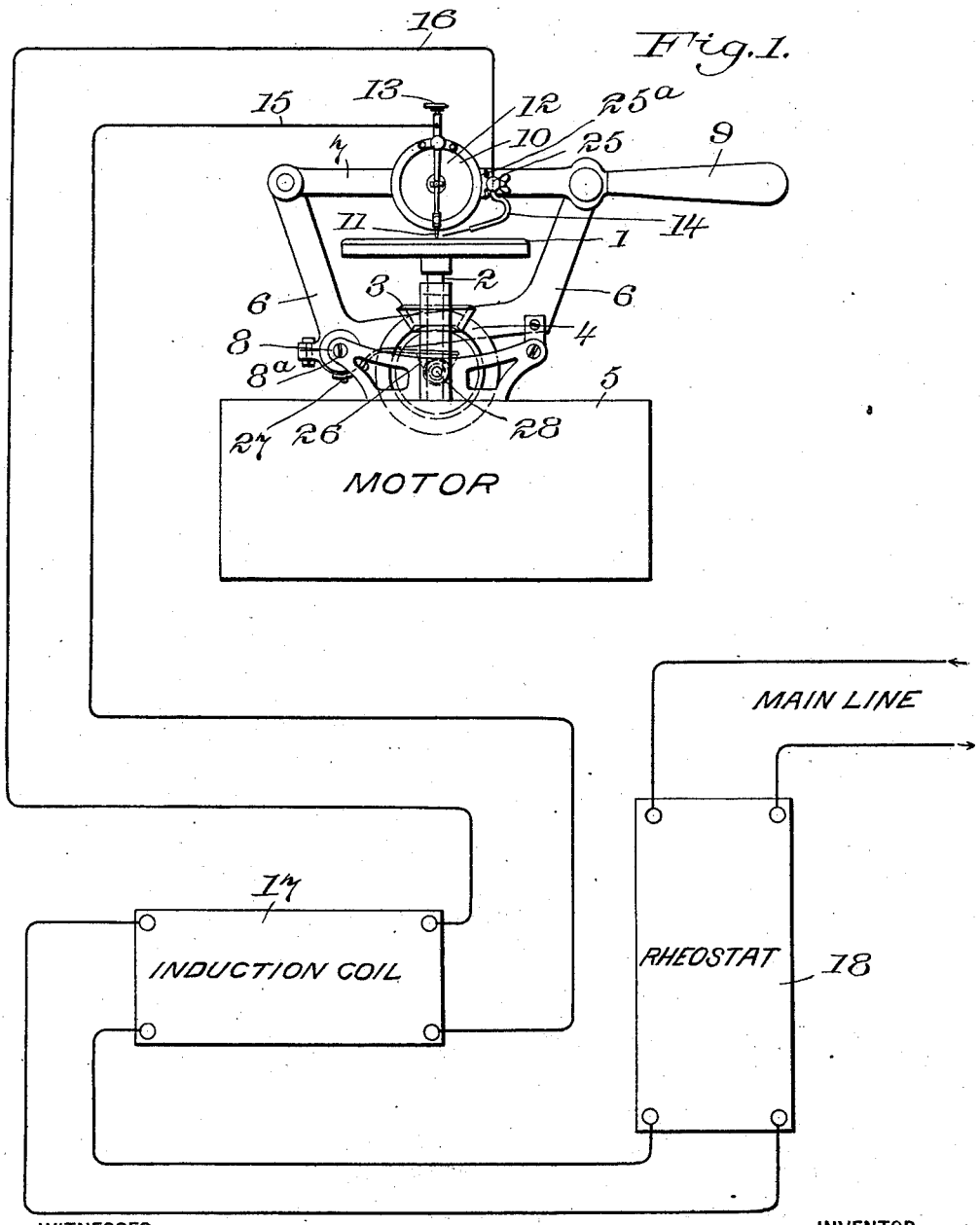
L. P. VALIQUET

SOUND RECORDING APPARATUS.

(Application filed June 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

E. Clark

W. H. Campbell.

INVENTOR

Louis P. Valiquet

BY Parker & Burton Smith

ATTORNEY.

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Fig. 2.

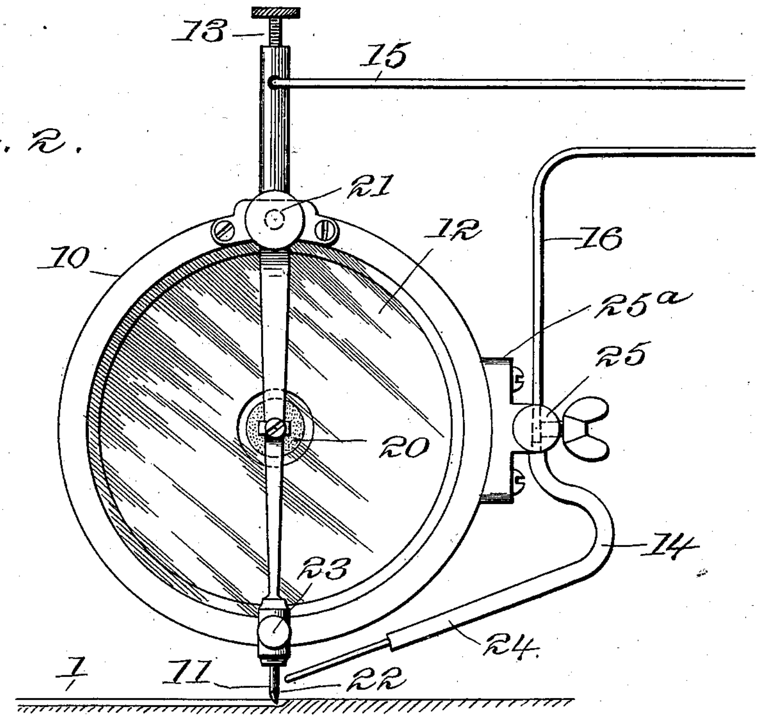
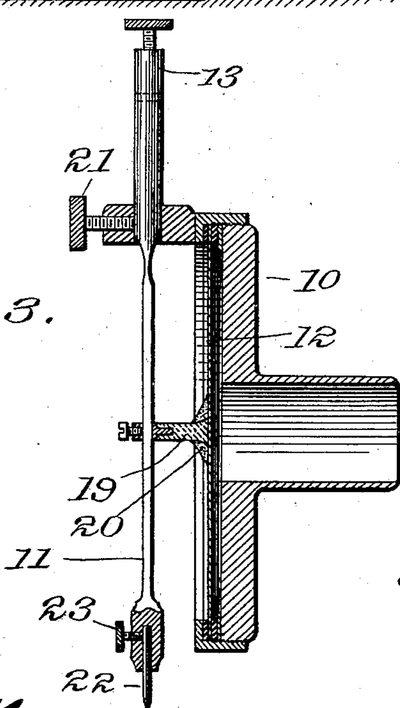


Fig. 3.



WITNESSES:

INVENTOR

Louis P. Valiquet

BY

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF SAME PLACE.

SOUND-RECORDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,106, dated June 11, 1901.

Application filed June 8, 1899. Serial No. 719,770. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Sound-Recording Apparatus and Methods, of which the following is a specification.

My invention relates generally to the art of recording vibrations in a suitable material which will retain an undulatory or other line representing said vibrations.

More specifically, my invention consists of an improved apparatus for recording sound-vibrations in a solid material, from which material or from a copy or negative of which said vibrations may be reproduced.

While my invention is applicable to all methods of sound-recording, whatever the character of the record-line to be produced, it produces the best results when employed in that method in which an undulatory line of even depth is produced by the sound-vibrations, such being the character of sound-record used with what is popularly known as the "gramophone."

One disadvantage heretofore resulting from the ordinary method of recording in various materials by etching with chemicals or by the use of a plain cutting-tool has been the roughened character of the surface of the groove so formed. These roughnesses occur not only in the sides of the undulatory groove of even depth, but also in the bottom of said groove, and as the reproducing-needle of the gramophone often rides upon the bottom of the groove these roughnesses in the surfaces produce the constant scratching or roaring sound in the reproducer, which is at times annoying and always tends in part to drown out the musical or other sounds which are being reproduced. My invention overcomes this difficulty by making the record-groove in a fusible material, which is caused to melt at the point of contact with the recording-needle by virtue of the heating of said needle. This needle and the material of the record-blank adjacent to the point of the needle I heat by application of the electric current, and I find the most convenient method of utilizing said electric current and localizing the necessary heat at the point of the needle, where it is to be employed, is to produce a continuous succession of sparks from said needle, said sparks jumping from a point adjacent to its extremity to an adjacent electrode.

One form of apparatus for carrying out my above-described invention is illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is a side elevation of the recording-machine with the electrical connections shown in diagram. Fig. 2 is an enlarged detail elevation of the recorder or sound-box. Fig. 3 is a central longitudinal section of the same.

Throughout the drawings like reference-figures refer to like parts.

A tablet 1, of fusible material, preferably one of the waxes or some wax-like compound or composition, is rotated by means of a vertical shaft 2, carrying the bevel-gear 3, meshing with the bevel-gear 4, operated by any suitable train of gearing from a motor, (not shown,) preferably concealed in the box 5. Projecting arms 6 6 from a swinging carriage sliding on guides on the main frame 8, in which the motor-gearing is journaled, carry the cross-piece 7', said swinging frame being pivoted to and sliding on the shaft or guide 8^a. The said swinging frame is controlled by the handle 9 and when in the position shown in Fig. 1 is caused to slide upon the shaft 8^a by means of a half-nut 26, carried by a projection 27, said half-nut gearing with a screw-thread 28 on the shaft of the bevel-gear 4, these parts being indicated in dotted lines in Fig. 1. The swinging frame carries the recorder 10, which has any suitable form of vibrating needle 11 phonetically connected with the diaphragm 12, the point of said needle projecting slightly below the surface of the tablet 1 when the recorder is in the position shown in Fig. 1.

Electrically connected with the vibrating needle 11 is the binding-post 13, to which one terminal 15 of an electric circuit is connected. An electrode 14, carried by binding-post 25, set in a piece of indurated fiber 25^a or other suitable insulation on the recorder, has its point arranged adjacent to the point of the vibrating needle 11. This electrode is connected with the other terminal 16 of the circuit. Preferably the induction-coil (represented at 17 diagrammatically) has its second-

ary in the circuit of the wires 15 and 16 and its primary controlled by a rheostat, (diagrammatically represented at 18,) the current being supplied from any convenient source of electrical power. As the vibrating needle 11 may become heated more or less, especially by the erroneous manipulation of the electrical apparatus, I prefer to employ some non-heat-conducting material—such as bone or similar material which is a good conductor of sound, while a bad conductor of heat—to furnish the connecting-piece 19 between the needle 11 and the diaphragm 12. This piece 19 may be positively attached to the diaphragm 12 by cement 20 or in any other convenient manner. The needle 11 is adjustably mounted on the recorder or sound-box by the set-screw 21 and preferably has a detachable tip 22, held by the set-screw 23. The electrode 14 may be made of any convenient shape; but I find that the end of an ordinary copper wire having the insulation 24 removed at the point will serve.

The mode of operation of the above-described apparatus when my method is employed is as follows: The record-tablet 1 is set in rotation by the motor 5, the recorder placed in the position shown in Fig. 1, and a feed motion radially of the tablet being given to the recorder by the feed-screw 28 and half-nut 26, as before described, the point of said needle traces a spiral line on the surface of the tablet 1. Direct electrical connections being established, the induction-coil 17 will cause a continuous series of sparks to pass from a point at or near the extremity of the needle-tip 22 to the electrode 14, thus heating the tip of the record-needle sufficiently to melt that portion of the wax-like tablet immediately in contact with it. It is evident, therefore, that the needle will melt out a fine spiral line in the revolving tablet 1. If then sound-waves produced by the voice or an instrument are sent into the sound box or recorder 10 and the diaphragm 12 vibrated thereby, said vibrations will be transmitted to the needle 11, and instead of tracing a true spiral the needle-point will trace an undulatory spiral line faithfully representing the sound-wave vibrations. As the hot needle leaves any particular part of the record the fused material will quickly solidify, so that the needle leaves behind it a groove having smooth walls and bottom in place of the rough and torn surfaces and ragged edges left by a cutting or tracing needle when working cold. When the record is completed, the swinging frame 7 is thrown up and the tablet removed and preferably copied in some harder material by electroplating or otherwise for purposes of reproduction.

The advantages of my invention consist in the smooth and even surface of the record-groove produced as above explained and also in the accuracy of the record, which arises from the fact that the needle has no mechanical work whatever to do in making the record. The heat radiated from its point melts the fusible material of the tablet within a given distance of the needle, so that it need never touch the solid material, but travels always in a liquid or semiliquid mass produced by its own heat. Thus the needle is free to reproduce every slightest vibration given to the diaphragm, and said vibrations are neither restricted or distorted as, is the case where the recording-needle has to overcome a resistance presented by the recording material when a solid material.

It is evident, of course, that various changes could be made in the apparatus illustrated without departing from the spirit and scope of my invention, it being essential only that the recording-needle shall lie within the heating zone of an arc produced electrically.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively.

2. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with the heat-insulating material between the needle and the diaphragm of the sound-box.

3. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with the rotating tablet of fusible material in contact with the point of the needle.

4. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with the rotating tablet of fusible material in contact with the point of the needle, and the swinging frame on which both sound-box and electrode are mounted.

5. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with an induction-coil, the secondary of which is included in said electric circuit.

Signed by me at New York city this 6th day of June, 1899.

LOUIS P. VALIQUET.

Witnesses:
LILIAN FOSTER,
W. H. PUMPHREY.