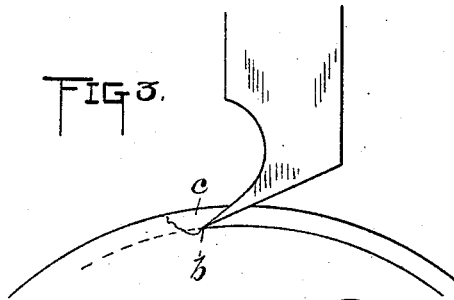
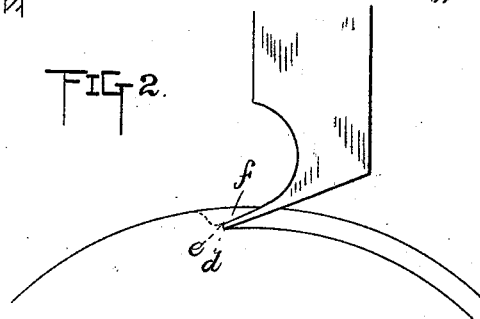
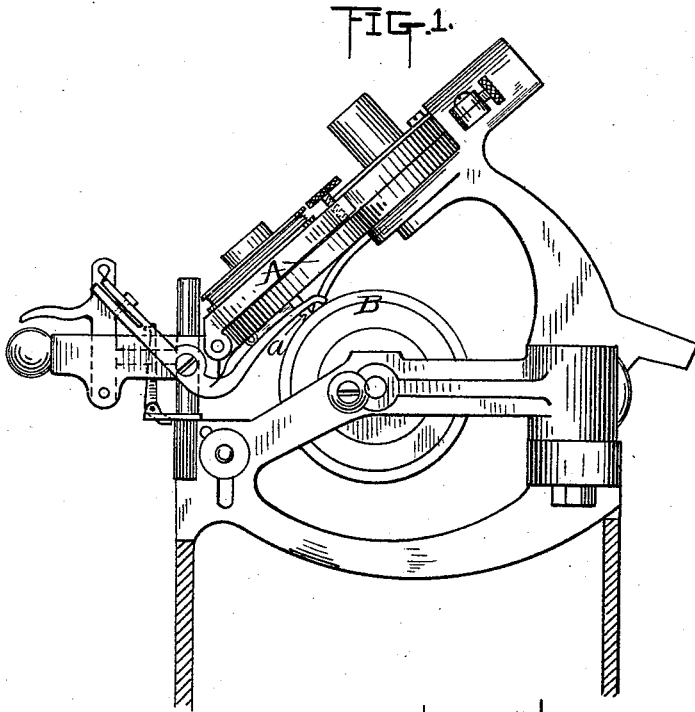


(No Model.)

T. A. EDISON.  
PHONOGRAPH RECORDER.

No. 437,425.

Patented Sept. 30, 1890.



WITNESSES:  
*E. Rowland*  
*W. Elzri*

INVENTOR  
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BY  
*John S. ...*  
ATTORNEYS

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PHONOGRAPH-RECORDER.

SPECIFICATION forming part of Letters Patent No. 437,425, dated September 30, 1890.

Application filed February 11, 1889. Serial No. 299,455. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Recorders, (Case No. 823,) of which the following is a specification.

As has been made known by my patents numbered 393,967 and 393,968, the recorder of my improved phonograph is provided with a cutting-tool recording-point presenting a cutting-edge in advance of the stock of the tool. This tool enters the surface of the phonogram-blank, cutting a groove in the blank, the bottom of the groove being formed by the extreme point of the knife, while the sides of the groove are cut by the upper side edges of the point which form oblique cutting-edges. This cutting-tool, entering beneath the surface of the material of which the phonogram-blank is formed, cuts a fine chip, which I have found, in breaking away from the body of the material, carries with it a part of the material below the line of cutting. This is due to the cohesion of the material, which, in breaking away from the body of the material, produces pits or irregularities in the bottom of the groove, which make foreign noises in the reproducer. This action I have found is greater with phonogram-blanks made of hard materials—such as hard metallic soaps or waxes mixed with hardening substances—since the cohesion in such material seems to be greater than in soft waxes. These hard materials I prefer to employ because the records produced upon them are much more perfect than with softer materials, and hence the difficulty that I have stated becomes one of large importance in the practical operation of the phonograph.

I have found that by drawing a fine whetstone across the point of the knife which forms the recording-point, so as to make such point blunt, the chips, in breaking, will break away from the upper edge of the point instead of from its lower edge, and if the thickness which the point is given is greater than the mass of material removed below the point of breaking, due to the cohesion of the particles, the cutting-tool will make a perfectly-smooth groove, which will have no other irregulari-

ties than those due to the vibrations of the point caused by the action of the sound-waves upon the diaphragm. The recording-point still remains a cutting-tool, since the upper side edges of the point still cut obliquely the sides of the groove, and the entire point enters beneath the surface of the wax and projects forward beneath such surface in advance of the stock of the tool. I have found that when the point is made to enter the surface three one-thousandth of an inch the bluntness given to the extreme end of the point may be less than one one-thousandth of an inch. If a deeper cut is made in order to bring out tones of great variation in amplitude—such as will be found in singing—the bluntness of the point may be greater, since the greater the depth of the chip the greater will be the depth to which the cohesion of the particles will cause the carrying away of the material below the point of cutting.

In the accompanying drawings, forming a part hereof, Figure 1 is a sectional view of a phonograph, showing the recorder in position for operation; and Figs. 2 and 3 represent, on an exaggerated scale, the action of the improved recording-point and the point heretofore employed by me.

A is the frame carrying the recorder of the phonograph, the recording-point *a* of which is a cutting-tool having a cutting-edge in advance of the stock of the tool. This recording-point acts to cut a groove in the surface of the phonogram-blank B, at the same time impressing upon the bottom of the groove a record of the sound-waves imparted to it by the diaphragm. When the extreme forward edge of the cutting-tool recording-point is brought to a fine cutting-edge *b*, as shown in Fig. 3, the chips *c*, in breaking away from the body of the material, carry with them some material below the line of cutting, as shown by the dotted line in Fig. 3. To avoid this difficulty, I grind off the point of the tool slightly, producing two edges at its point—a lower one *d* and an upper one *e*—as shown in Fig. 2. The chip *f* breaks away from the upper edge *e*, as shown by the dotted line in Fig. 2. The pit formed by the breaking away of the chip not being equal to the width of the point, and hence the lower edge *d* makes a clean cut upon the bottom of the groove.

What I claim as my invention is—

1. A phonograph-recorder having for its recording-point a cutting-tool with a cutting-edge in advance of the stock of the tool, which edge is made blunt to prevent the breaking of the recording material below the line of cutting, substantially as set forth.
2. A phonograph-recorder having the cutting-tool recording-point *a*, with its cutting-edge provided with upper and lower edges *d e*, to prevent the breaking of the material below the line of cutting, substantially as set forth.
3. A phonograph-recorder having for its re-

15 cording-point a cutting-tool with the cutting-edge in advance of the stock of the tool, the thickness of said edge being greater than the thickness of the material that breaks away from the mass at the point of cutting, substantially as described.

This specification signed and witnessed this 20 1st day of February, 1889.

THOMAS A. EDISON.

Witnesses:

W. PELZER,

D. H. DRISCOLL.