No. 758,861. PATENTED MAY 3, 1904.

C. A. SHAFFER.

NOTE SHEET FOR SELF PLAYING MUSICAL INSTRUMENTS.

APPLICATION FILED DEC. 9, 1903.

NO MODEL.

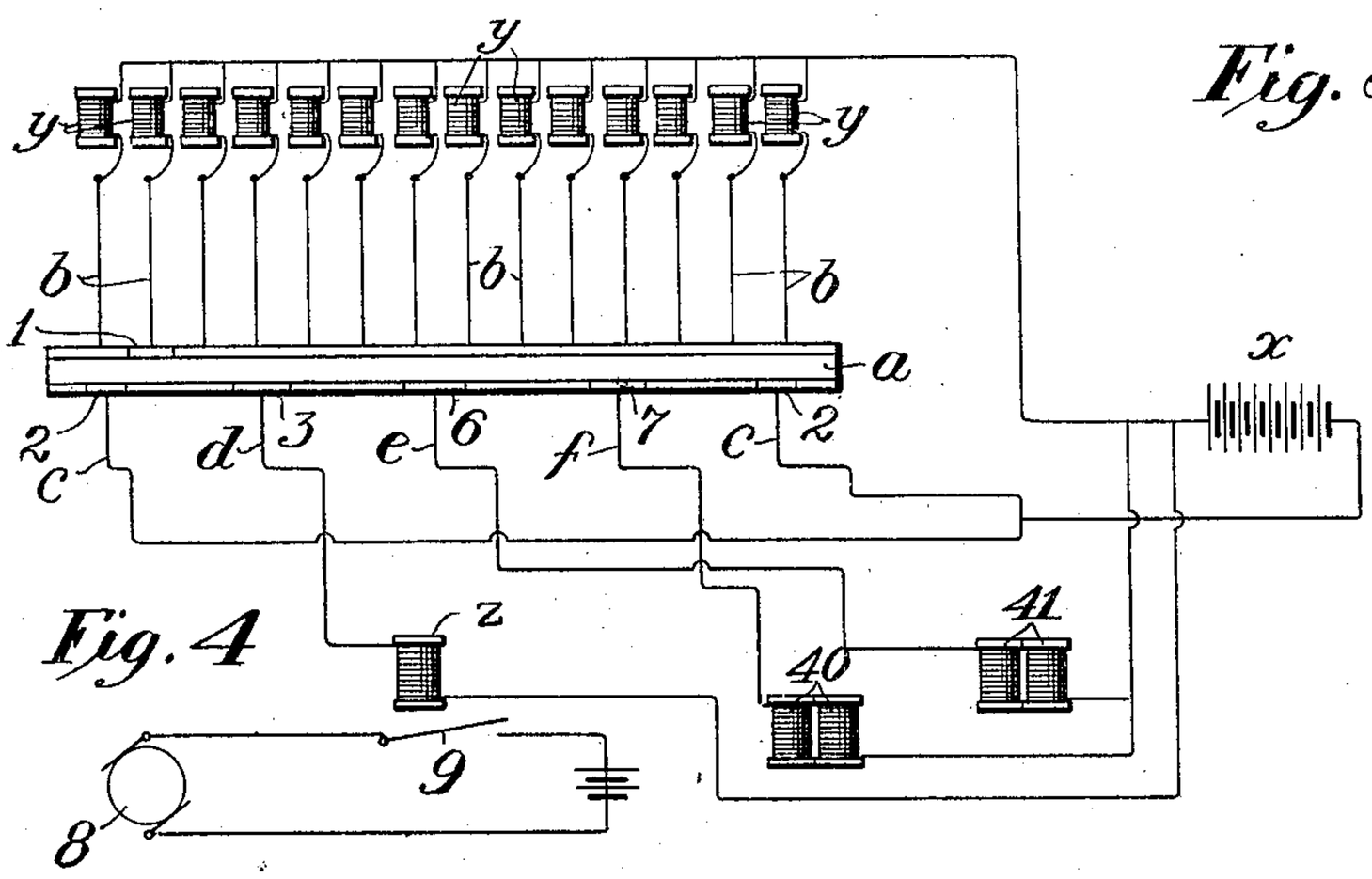

Fig. 4

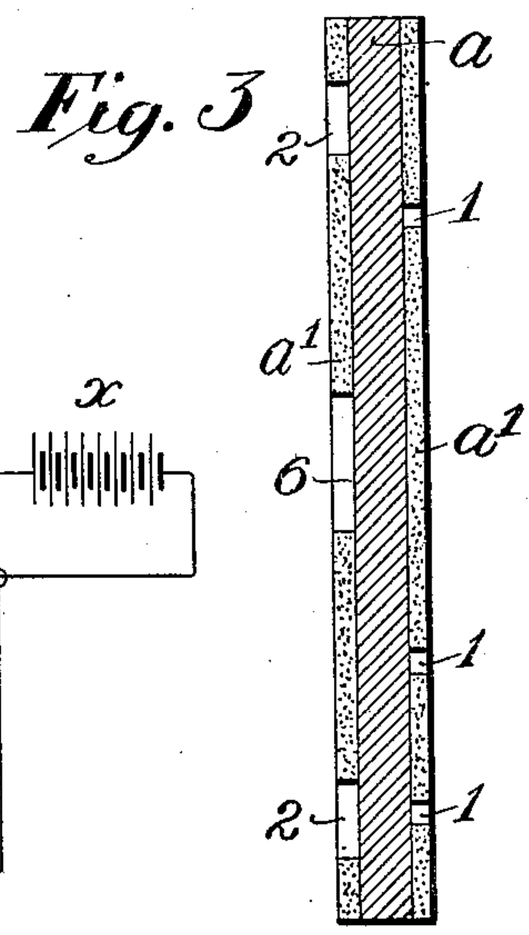

Fig. 3

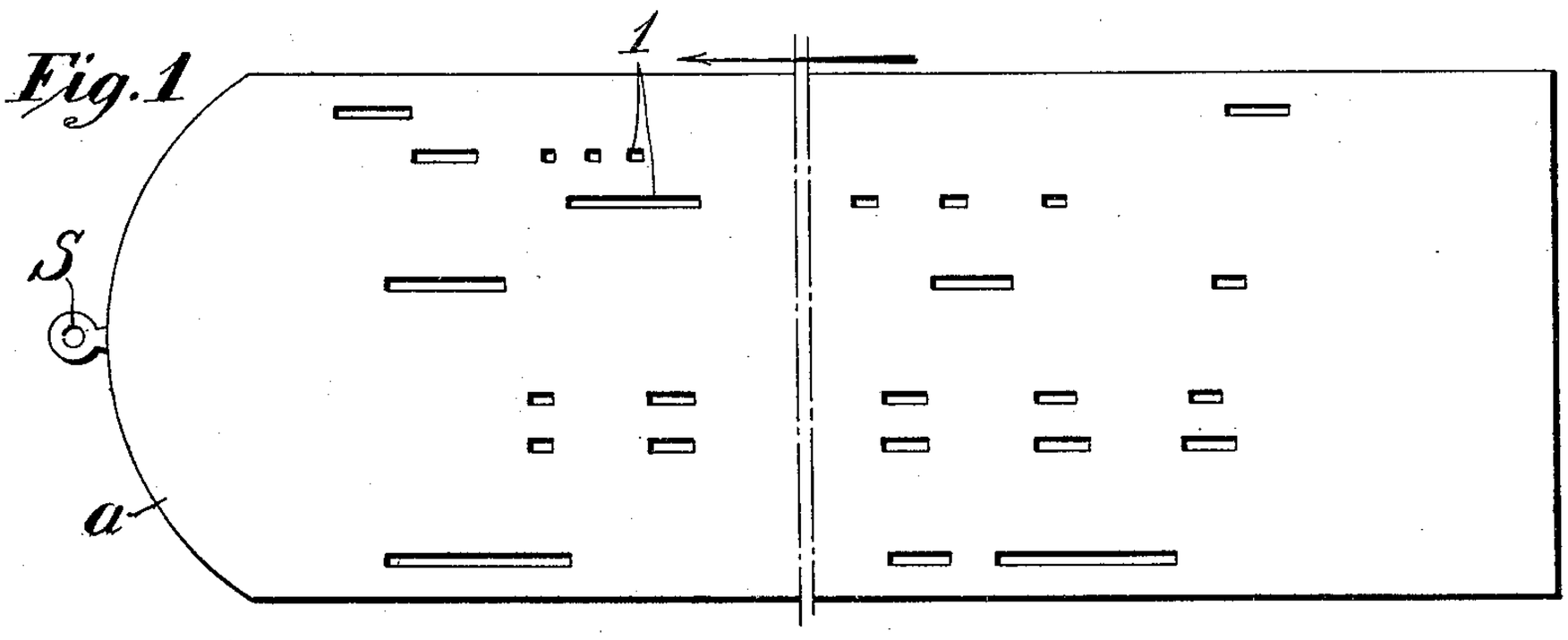

Fig. 1

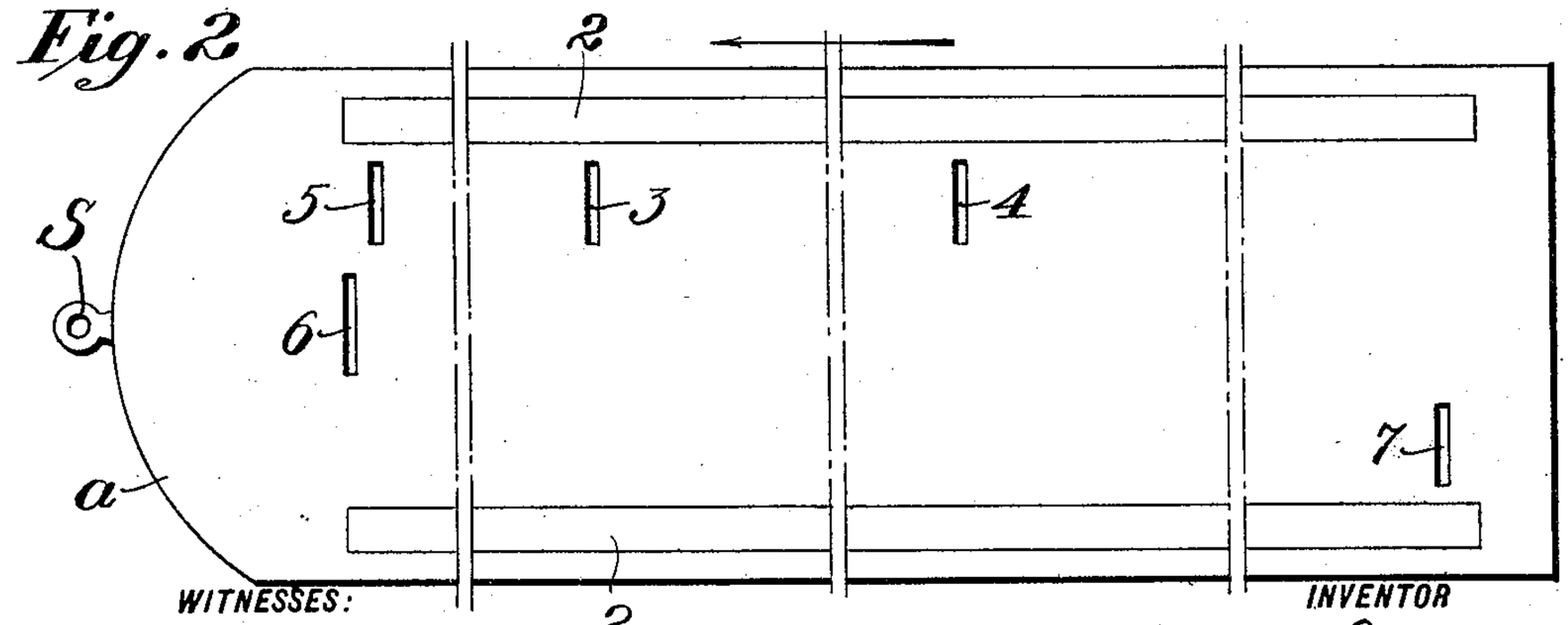

Fig. 2

WITNESSES:

W. M. Hamilton

William B. Marks

INVENTOR

Charles A. Shaffer

BY

Harding & Harding

ATTORNEYS.

No. 758,861. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

CHARLES A. SHAFFER, OF PHILADELPHIA, PENNSYLVANIA.

NOTE-SHEET FOR SELF-PLAYING MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 758,861, dated May 3, 1904.

Original application filed July 21, 1903, Serial No. 166,450. Divided and this application filed December 9, 1903. Serial No. 184,395. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. SHAFFER, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Note-Sheets for Self-Playing Musical Instruments, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to music-sheets for self-playing musical instruments.

The invention has for its object to enable the sheet to be made with a given number of notes more compact than heretofore or with a given size of sheet to enable a greater variety or number of notes to be placed on the sheet than heretofore.

The invention consists of a sheet having insulated surfaces on both sides thereof, the insulation being cut away or omitted to form notes.

The invention also consists of a sheet having insulated surfaces in which the insulation is cut away or omitted to form in addition to the notes a contact-surface in the form of a continuous contact-strip coöperating with the notes.

The invention also consists of a sheet having insulated surfaces in which the insulation is cut away or omitted to form in addition to the notes and continuous strip other contact-surfaces adapted to coöperate with the continuous strip.

The music-sheet is adapted to be used with a machine having certain characteristic features adapted to coöperate with the said notes, continuous strip, and contact-surfaces to enable the machine to feed the sheet, operate the keys or strings of the instrument to be played, automatically reverse itself when the sheet is completely unwound, and stop at the end of the tune or where more than one tune appears on the sheet at the end of each tune. I do not, however, herein describe the entire machine, but only so much of it as is essential to enable the music-sheet forming the subject of this application to be clearly understood.

In the drawings, Figures 1 and 2 are respectively top and bottom plan views of the music-sheet. Fig. 3 is an enlarged transverse sectional view of the same. Fig. 4 is a diagrammatic view showing the music-sheet, fingers, and electric devices and connections.

a is the music or note sheet. The same consists of a body of metal, such as copper, having an insulated surface *a'* on both sides. This insulated surface may be formed by coating the metal with a liquid non-conducting solution which hardens on setting or cooling, for which purpose a tough or brittle gum or varnish may be employed. I have found that a solution of commercial French varnish and alcohol is excellently adapted to the purpose. The insulated surface may also be formed by treating the metal body with an acid, causing the surface of the metal to corrode and rendering it non-conducting. The insulated surface may also be formed by attaching a sheet of insulating material to the metal body. The insulating surface or material on one side is scraped, cut off, or omitted, as shown in Figs. 1 and 2, to form the notes, these cut-away portions 1 corresponding to the perforations of an ordinary music-sheet. On the other side the insulating-surface is scraped, cut off, or omitted to form one or more long continuous strips 2 2, a series of short contact-surfaces 3 4 5, a contact-surface 6 at one end of the strip, and a contact-surface 7 at the other end of the strip, all of which are adapted to be engaged by suitable fingers and to control the stopping and rewinding of the music-sheet, as well as the operation of the keys or strings of the musical instrument, as will be fully described. It will be understoood that as I am not claiming the process of constructing the music-sheet I do not limit myself to any particular way of forming the insulated or non-insulated portions of the sheet.

b b, &c., represent a series of note-fingers, there being one finger to each key or string of the musical instrument to be operated. As before stated, the cut-away portions 1 are of course arranged like the perforations of an ordinary music-sheet, so that when any par-

ticular note is to be struck a cut-away portion on the sheet is arranged in line with the particular finger controlling the particular key or string adapted when struck to produce that note.

c c are fingers contacting with the long continuous contact-strips 2 2. The fingers *c* are electrically connected with a battery *x*. The fingers *b* are electrically connected with magnets *y*, there being one magnet for each finger. The battery is electrically connected with each magnet. When any finger *b* engages one of the notes 1, the battery-circuit is closed, the current passing from the battery to fingers *c*, thence through the metal body of the music-sheet, finger *b*, corresponding magnet *y*, and back to the battery. When any magnet is excited, it attracts its armature, which is connected with one of the keys or strings of the instrument. The particular mechanism connecting the magnets and the musical instrument to be operated is not shown, as it forms no part of my invention.

d is a finger contacting with the music-sheet and in line of travel of the contact-surfaces 3, 4, and 5. These contact-surfaces are provided in case the sheet is cut away to form notes for two or more tunes, and one of these contact-surfaces is placed at the end of the notes of each tune. In the drawings I have shown a sheet, partially broken away, that is supposed to contain the notes of three tunes, and three contact-surfaces 3, 4, and 5 are therefore provided. The object of these contact-surfaces is to stop the machine at the end of each tune. To this end I provide in the circuit of the motor 8 a cut-out switch 9, forming the armature of a magnet *z*, one pole of the magnet being connected with the battery *x* and the other pole with the finger *d*. When the finger *d* contacts with either of the contact-surfaces 3, 4, and 5, the circuit is closed, the current passing from the battery *x* to fingers *c*, to strip 2, through the metal body of the music-sheet to contact-surface 3, 4, or 5, to finger *d*, to magnet *z*, and thence back to the battery *x*, thereby exciting the magnet *z* and opening the cut-out switch 9, thereby stopping the motor 8. If the motor 8 is employed to feed the sheet, it will be understood that at once upon the closing of the motor-circuit the travel of the sheet will cease until the machine is started by closing the switch 9 by hand or by any well-known automatic mechanism such as is employed on slot-machines.

e f are fingers contacting with the music-sheet and in line of travel of the contact-surfaces 6 and 7, respectively.

40 is a magnet electrically connected with finger *f*, and 41 a magnet electrically connected with finger *e*, both magnets being connected with the battery *x*.

Suitable mechanism controlled by magnet 40 is provided, whereby upon exciting said magnet the forward feed of the sheet is stopped and the sheet caused to feed backwardly. Suitable mechanism controlled by magnet 41 is provided, whereby upon exciting said magnet the backward feed of the sheet is stopped and the sheet caused to feed forwardly. Such mechanism is fully set forth and described in my two applications hereinafter mentioned and need not be herein described, as it forms no part of this invention.

When the sheet reaches the end of its forward travel and the fingers *b* have passed over the last of the notes, the finger *f* contacts with the contact-surface 7 and the following circuit is established: from the battery to fingers *c*, cut-away strips 2, through the conducting-body of the music-sheet to contact-surface 7, finger *f*, magnet 40, and to the battery, thereby exciting the magnet 40 and reversing the direction of travel of the sheet. When the sheet reaches the end of its backward travel, the finger *e* contacts with the contact-surface 6 and the following circuit is established: from the battery to fingers *c*, contact-strip 2, through the conducting-body of the music-sheet to contact-surface 6, finger *e*, magnet 41, and to the battery, thereby exciting the magnet 41 and again reversing the direction of travel of the sheet.

Suitable mechanism should be provided to lift fingers *b* and the finger *d* out of contact with the sheet during the back feed of the same; but this mechanism forms no part of this invention and need not be described.

I do not herein lay claim to the arrangement of fingers, magnets, switches, motor, battery, and electric circuits described, as the same forms the subject-matter of a separate application, Serial No. 166,450, filed July 21, 1903, of which this application is a division.

It will be understood that it is not essential that the contact portions 1 should be arranged on one side of the music-sheet and the contact portions 2, 3, 4, 5, 6, and 7 on the other side. So far as the music-sheet itself is concerned, any of the contact portions may be placed on either side and the fingers coöperating therewith arranged accordingly. For example, by equally distributing the various contact portions on both sides a music-sheet of but slightly over half the width of an ordinary music-sheet will be secured, thus enabling the machine to be placed within a smaller compass.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. An imperforate music-sheet consisting of a body of conducting material having insulated surfaces on both sides thereof, the insulation being cut away to form notes.

2. A music-sheet consisting of a body of conducting material having surfaces of insu-

lation on both sides thereof, the insulation being cut away to form notes and contact-surfaces.

3. A music-sheet consisting of a body of conducting material having surfaces of insulation on both sides, the insulation being cut away to form notes and a continuous contact-strip extending lengthwise of the sheet.

4. A music-sheet consisting of a body of conducting material having surfaces of insulation on both sides, the insulation being cut away to form notes, a continuous contact-strip extending lengthwise of the sheet, and a contact-surface at each end of the sheet.

5. A music-sheet consisting of a body of conducting material having surfaces of insulation on both sides, the insulation being cut away to form one or more sets of notes, a continuous contact-strip extending lengthwise of the sheet, and a contact-surface at one end of each set of notes.

6. A music-sheet consisting of a body of conducting material having surfaces of insulation on both sides, the insulation being cut away to form one or more sets of notes, a continuous contact-strip extending lengthwise of the sheet, a contact-surface at one end of each set of notes, and a contact-surface at each end of the sheet.

In testimony of which invention I have hereunto set my hand at Philadelphia on this 5th day of December, 1903.

CHARLES A. SHAFFER.

Witnesses:
M. F. Ellis,
M. M. Hamilton.