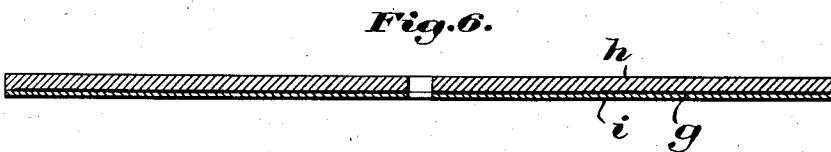
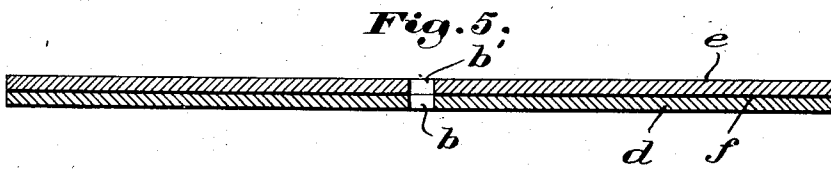
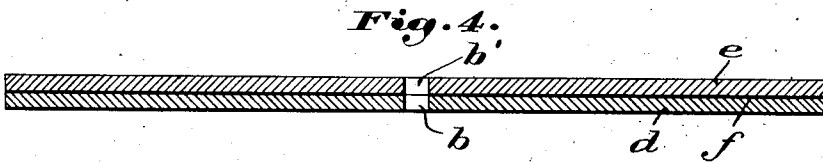
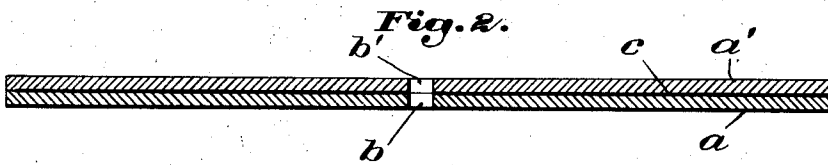
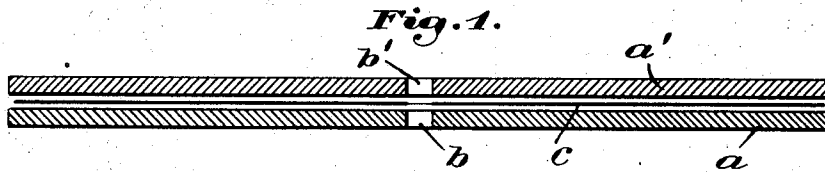


J. B. MILLET.
 PHONOGRAPH RECORD.
 APPLICATION FILED JAN. 5, 1911.

1,047,971.

Patented Dec. 24, 1912.



Witnesses:

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PHONOGRAPH-RECORD.

1,047,971.

Specification of Letters Patent.

Patented Dec. 24, 1912.

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To all whom it may concern:

Be it known that I, JOSIAH B. MILLET, a citizen of the United States, and a resident of Boston, county of Suffolk, State of Massachusetts, whose post-office address is 120 Boylston street, Boston, Massachusetts, have invented an Improvement in Phonograph-Records, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to phonograph records and more particularly though not exclusively to records in disk form.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one or more specific embodiments thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings: Figure 1 shows the component parts of a disk record embodying one form of my invention in the condition in which such parts are prior to pressing; Fig. 2 shows the complete record after pressing; Fig. 3 shows in cross section a portion of composition sheet material from which a record made according to one form of the invention may be formed; Fig. 4 shows a disk formed from such material prior to pressing; Fig. 5 shows a completed record after pressing; and Fig. 6 shows a modified form of record.

Referring to the drawings and first to the embodiment of my invention shown in Figs. 1 and 2, I have there illustrated one form of record consisting of a superior type of double-faced record disk having sound grooves of varying depth, that is to say, of the so-called hill and valley type.

In the production of double-faced record disks it has heretofore been the common practice to use a homogeneous body of plastic record material with the sound grooves on opposite faces pressed into one and the same mass of material. Such a double-faced record disk is described in patent to Petit No. 749,092, where it is stated that the simultaneous pressure by the opposing matrices in the die under similar conditions and in one and the same homogeneous mass of plastic material insures uniformity in the

flow of the said material at both faces of the disk.

I have found that in the case of double-faced records and especially those having sound grooves with vertical undulations or of varying depth, the best results are obtained by avoiding the use of a homogeneous or continuous mass of plastic material.

One feature of my invention consists in so dividing or separating the plastic material presented to one matrix from the plastic material presented to the other matrix that instead of securing a common uniform displacement at both sides of the same undivided intermediate plastic mass under the action of the two opposing matrices, the displacement or flow of the one mass facing the one matrix takes place independently of the flow or displacement of the separated mass facing the opposite matrix.

The quality of a sound record is largely dependent upon the density and uniformity of the record material in and about the record groove. In the case of records of the degree of thinness commercially employed, if a single homogeneous mass of material is used the displacement of material under one matrix appears to interfere with or modify the free displacement of material under the opposing matrix, so that there tends to result a variation and inferiority in the quality of the record which seems to be due to a variation in the density of the material under different portions of the sound groove. This is caused, as I apprehend, by the fact that the varying and irregular projections on the face of one matrix acting on the thin homogeneous intermediate layer of plastic material so modifies the movement of such material that the freedom and facility with which the material at the bottom of the groove adapts itself to such varying and irregular projections on the face of the opposing matrix is impaired. In other words, notwithstanding that a differential or non-uniform flow at opposite sides should be permitted, a uniformity of flow is enforced by this process, which flow is the resultant of the two displacements at the two opposite faces. This is the case with records having sound grooves provided with lateral undulations as well as those having sound grooves provided with vertical undulations,

although in the latter case the interference between the displacement of material at one side and the displacement of material at the opposite side seems more directly to impair the quality of the record.

I have found that the interposition of a separator acting as a partition between the material presented to one matrix and the material presented to the other, and thereby interrupting the continuity and homogeneity of the material will separate the plastic mass for purposes of flow and displacement into two distinct bodies so that, while the pressure of one matrix is transmitted from one mass through the separator to the other mass, and the said matrix is thereby effective in pressing the material into the irregular projections of the opposing matrix in just the same way that the smooth faced platen is effective in pressing a single faced record, nevertheless the displacement or flow of plastic material under and about the projections of such matrix is free and unimpaired and independent of the displacement or flow of the separated mass of material under and about the projections of said opposing matrix, and vice versa.

While the thickness of the separator is in a sense quite immaterial so long as it does not amount to what might be termed a backing, it is preferable that it be made as thin as possible and form as small a part of the mass of the record as is consistent with the separation of the two bodies of plastic material as regards independence of flow in the plastic state when in the press and under the action of the two matrices. Nor is it essential, though ordinarily preferable, that the separator consist of an impervious or impenetrable division wall, for a coarsely fabricated, porous or meshed material might suffice under suitable conditions to separate the flow of plastic material on the two sides of the disk and allow one to take place independently of the other.

Any suitable material may be employed for the separator, but good results are obtained by using a sheet of paper, preferably thin, tough and smooth. The thickness need not exceed one one-hundredth of an inch, or less. Thin bond paper seven or eight thousandths of an inch thick will serve the purpose.

I am aware that disk records have been made composed in part of pasteboard sheets or the like, but in such cases such material has been in the form of a backing or foundation body and the object has been to strengthen the structure of the record by the addition of a large mass of cellular material or to cheapen the cost of production by substituting for the inner body portion of the record a relatively large amount of cheaper material for the more expensive plastic material. In such cases a large or

the largest part of the mass of the record has been composed of the pasteboard or other cellular material used and the plastic record receiving material has been applied thereto in the form of a thin surface film.

The best results, however, in the case of sound grooves having vertical undulations are only obtained where there is provided a relatively large mass of the plastic record-receiving material under the sound groove to act as a body or foundation therefor, such foundation materially improving the tone and the resonant quality of the record. By providing a thin paper or other separating wall between the two bodies of plastic material, to serve, not as a backing or foundation for the record, but as a mere partition, the total mass of plastic material is not appreciably or harmfully diminished and each record groove has substantially the requisite underlying foundation or body of record-receiving material to maintain the tone and quality of the record.

The resonant qualities of the disk may in fact be improved by a judicious selection of the material of which the separator is composed, while still leaving the major body of the disk composed of plastic record material. I have found that a thin layer of porous paper, such for example, as thin blotting paper will act as a separator and at the same time improve the resonant qualities of the disk, or two very thin layers of wood glued together with the grain arranged at right angles to prevent splitting, will serve as a resonant separator.

The separation of the record into two parts by the thin separator not only improves a record and particularly one of the hill and valley type, for the reasons stated, while giving it all the tone quality which a solid homogeneous record possesses due to the presence of a relatively large body of record material at and under the sound groove, but the separation of the record into distinct laminae or layers, apart from any structural strength residing in the separator itself, materially improves the structure of the record by diminishing the brittleness thereof and reducing the likelihood of breakage.

In forming a disk record in accordance with my invention any suitable plastic material may be employed, but ordinarily such material will comprise the customary and well known mixture of shellac and china clay or other infusorial earth or any suitable variation thereof known as gramophone record material. Such material may be applied to the upturned face of the underlying matrix in the form of a lump, a separator being placed on top of the said lump and then another lump of the plastic material upon the separator, the composite mass being thereupon subjected to the action of the press. Preferably, however, I previously

shape the plastic material by punching or cutting so that it has the form of disks of uniform thickness, or the approximate form of disks of uniform thickness. Such a disk is represented at *a* in Fig. 1 being perforated at *b* to receive the centering pin of the matrix. The parts in Fig. 1 as well as in the remaining figures of the drawings are shown of exaggerated thickness for the sake of clearness. Such disk preferably has a thickness about or somewhat greater than half the thickness of the finished record, for example about one thirty-second of an inch. This disk being placed upon the centering pin and upon the lower matrix, a centrally perforated disk *c* of thin paper is placed upon it and on top of the paper is then placed a second disk *a'* of plastic material similar to the disk *a*. This composite disk being then subjected to the action of the press, the upper and lower matrices will leave their imprints in opposing faces of the record, the separator *c*, however, preserving the required independence of flow or displacement as between the separate masses of plastic material on opposite sides thereof as has been more fully referred to above.

The completed record shown in Fig. 2 will comprise two solid layers of record material each of sufficient mass to give the requisite tone quality, such layers, however, being separated by the paper separator and being much less brittle than a solid record.

The paper disk *c* may be co-extensive with the disks *a* and *a'*, or may be much smaller in diameter, while still maintaining the desired independence in flow. Preferably, however, while extending beyond the limits of the sound record groove the said paper disk has its diameter somewhat less than that of the disks *a* and *a'*, so that the edges of the said paper will be slightly embedded in or coated by the material of the finished record as represented in Fig. 2 and therefore invisible. This may not always be necessary as the compression of the mass of the record will necessarily force the material over the edges of the paper.

If, desired, a single composite disk provided with its separator may be previously formed before the sound groove or grooves are pressed into its faces, such previously prepared disk consisting of an upper and lower layer of plastic material with an intervening separator. This can be done by rolling out the material into sheet form under heated rolls. A fragment of such material is represented in Fig. 3, this consisting of a continuous lower layer of plastic material *d* of the required thickness, an upper layer *e* of substantially the same thickness and a relatively thin intervening paper sheet *f*. From such sheet material a perforated disk such as is shown in Fig. 4 can be punched out, and this being placed in the press may

receive the impression of the sound grooves therefrom, forming the completed disk represented in Fig. 5.

In the usual process of pressing records where no separator is employed the free displacement and flow of the plastic material, which is ordinarily heavily charged with clay or other gritty matter, results in excessive frictional wear upon the matrices, necessitating their frequent renewal. The use of the separator, while leaving the material free to conform to the contour of the matrix, lessens the total aggregate displacement of the material toward the sides of the disk and saves a corresponding amount of wear upon the matrix. The excessive flow of material toward the sides of the disk moreover, and therefore the wear upon the matrix, is materially reduced by the previous preparation of the plastic material in sheet and disk form, or approximate disk form, as described, prior to the pressing action, the final pressing action being relied upon merely to impress the record groove into the material and slightly compress the disk as incidental to its operation.

The subdivision of the disk into layers reduces the liability to breakage, and the thinness of the record may therefore be reduced and the amount of plastic material may be cut down to the minimum amount which is required to give the desired tone and resonant quality.

The formation of the disk in the manner described permits the utilization at opposite faces thereof of masses of record receiving material having distinctly different characteristics, but each best adapted to receive the imprint of the particular kind of sound groove intended to be impressed therein. For example, the disk *a* in Fig. 1 may be composed of shellac mixed with a large proportion of clay and have impressed therein a record groove of a brass band, while the opposite disk *a'* may be composed of shellac charged with celluloid or other ingredients intended to provide a smoother surface and more effective groove for a soprano solo, violin or string quartet. This subdivision of the disk furthermore permits the employment of separate and opposite masses of plastic material contrasted by way of color or otherwise. For example, by the use of suitable pigments the material on one side of the separator may be colored blue and the material on the opposite side of the separator red, green, or some contrasting color other than blue. This makes it possible to distinguish at a glance which side of the disk is uppermost and when employed in connection with a system of impressing one class of pieces, for example, band music, into material of one color, and another class of pieces, for example, vocal music, into the material of another color, affords means for

readily identifying the character of the record which is uppermost.

In Fig. 6 I have shown another form of disk record where a thin paper partition *g* is provided which serves to separate the relatively thick mass *h* of plastic material which may have the same composition as in the case of the disk *a'* in Fig. 1, from a second body of material *i* which herein is thinner than the layer *h* and may consist of celluloid, or celluloid with other ingredients such as shellac with a small proportion of crocus powder, intended to give a smoother surface so that that side of the disk may be fitted to receive record grooves of pieces requiring for their best reproduction such a character of surface. The celluloid may be applied in sheet form and if so, being of lesser plasticity than the material *h*, the paper sheet *g* may then be omitted.

It will be obvious that my invention, while especially advantageous as to some of its features to double disk records, is not limited to disk records having sound grooves on both faces thereof nor alone to records provided with grooves having vertical undulations, but that as to certain of its features it is applicable to records having sound grooves provided with lateral undulations and to single record disks as well as to records having a cylindrical form.

While, for purposes of illustration, I have herein shown and described one specific form of my invention, it is to be understood that the same is not limited to the details herein described, but these may be varied within wide limits without departing from the spirit thereof.

Claims:

1. A molded sound record comprising a sheet of paper and resinous thermo-plastic record-material on either side of said paper, the whole pressed into an adherent mass,

the thermo-plastic record-material being sufficiently thick to render the record rigid and resonant and the paper sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

2. A molded sound record comprising a thin separating sheet of flexible material and resinous thermo-plastic record material on either side of said separating sheet, the whole pressed into an adherent mass, the thermo-plastic record material being sufficiently thick to render the record rigid and resonant, and the separating sheet sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

3. A molded sound record comprising a thin sheet of fibrous material and resinous thermo-plastic record material on either side of said fibrous material, the whole pressed into an adherent mass, the thermo-plastic record material being sufficiently thick to render the record rigid and resonant, and the fibrous material sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

4. A molded sound record comprising a thin sheet of fibrous material and plastic record material on either side of said fibrous material, the whole pressed while said record material is in a substantially uniform semi-fluid state into an adherent mass, the plastic record material being sufficiently thick to render the record rigid and resonant, and the fibrous material sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOSIAH B. MILLET.

Witnesses:

EVERETT S. EMERY,
THOMAS B. BOOTH.