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J. O'CONNOR.

TEMPO DEVICE FOR MECHANICAL MUSICAL INSTRUMENTS.

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Fig. 1

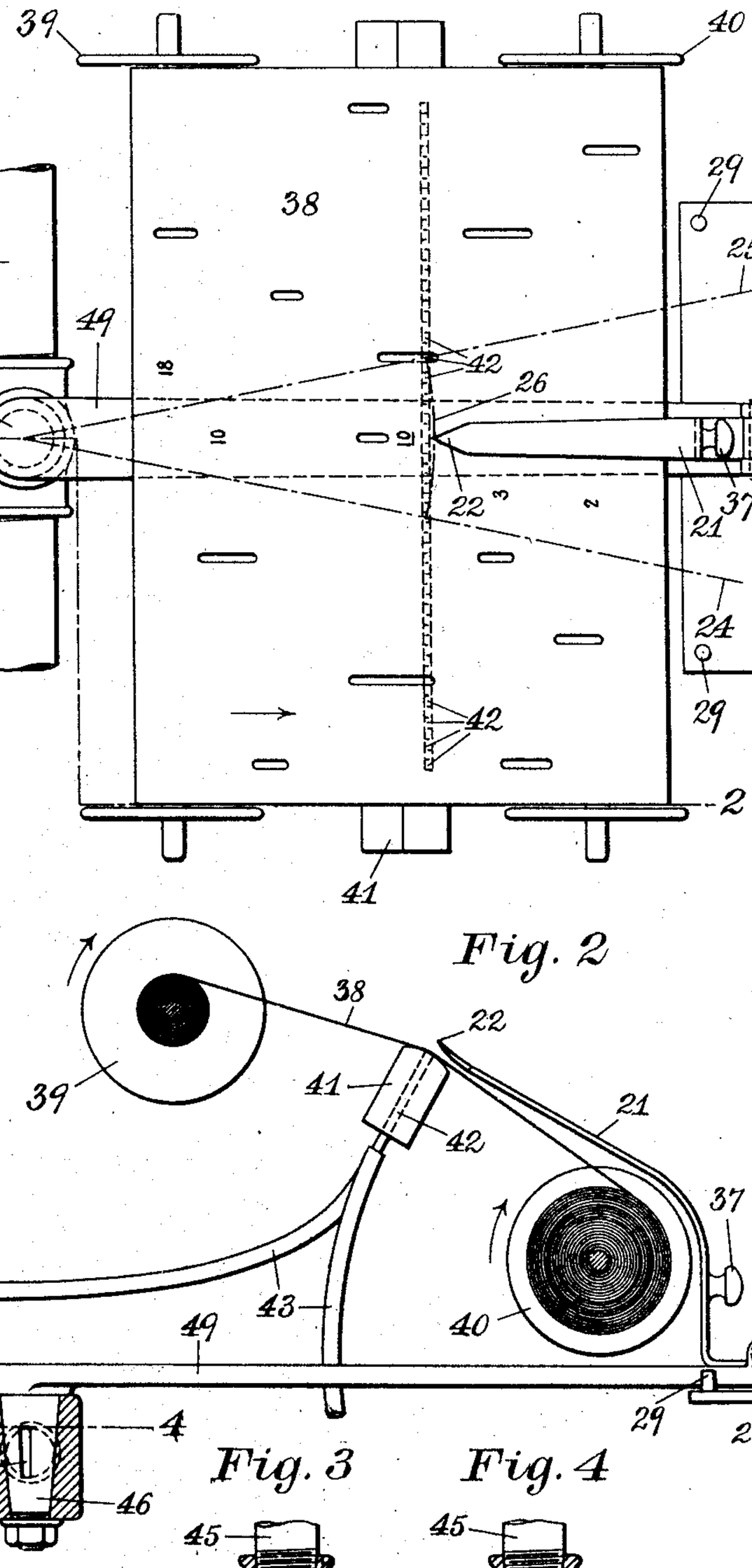


Fig. 5.

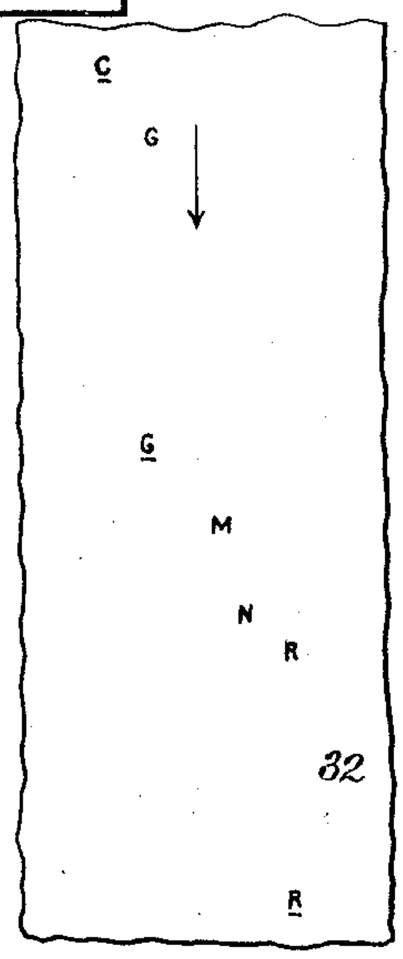


Fig. 2

Fig. 3

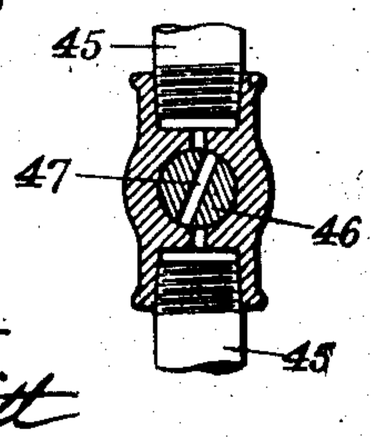
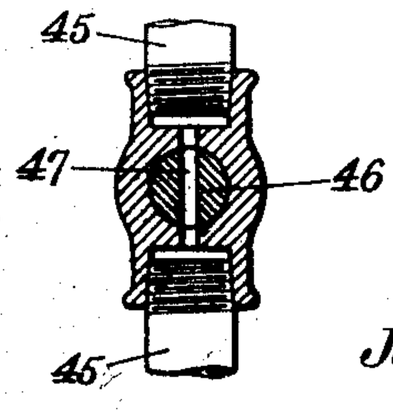


Fig. 4



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TEMPO DEVICE FOR MECHANICAL MUSICAL INSTRUMENTS.

No. 876,080. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed February 15, 1904. Serial No. 193,710.

To all whom it may concern:

Be it known that I, JAMES O'CONNOR, a citizen of the United States, and resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Tempo Devices for Mechanical Musical Instruments, of which the following is a full, clear, and exact specification.

This invention relates to improved devices for varying and controlling the time or tempo of the music produced by mechanical musical instruments. These devices are herein shown and described as being adapted to a well-known class of machines, the note sounding devices of which are controlled by a longitudinally traveling perforated music sheet.

Figure 1 is a plan view and Fig. 2 is an end view in section taken on the line 2—2 of Fig. 1, showing this invention applied to a well-known type of music sheet apparatus. Figs. 3 and 4 are plan views in section taken on the line 3—4 of Fig. 2, showing the controlling valve in two extreme positions, being entirely closed in Fig. 3, and entirely open in Fig. 4. Fig. 5 is a plan view of a fragment of a music sheet showing a modified way of applying the tempo indicating marks upon the music sheet.

Those instruments of this class which are provided with tempo regulating devices to be operated under the guidance of indications upon the music sheet, usually employ a lever or pointer which is moved by the operator to different positions on a fixed graduated scale, adjacent to the lever; and the margin or some other portion of the music sheet is provided with letters or numerals, so that the eye of the operator must be directed back and forth between the music sheet and the graduated scale, the operations being first to observe each succeeding letter or numeral upon the music sheet, and then to move the lever to a position approximately determined by the scale. The mental operations, and the repeated shifting of the eyes between the sheet and the scale, distract the operator's attention to an undue extent from the other functions of the instrument and from the expression marks and other indications now commonly employed upon music sheets.

In the present invention the variations in time are indicated upon the music sheet, in accordance with the composer's score, or in accordance with the musical taste of the arranger, by numerals which by their values and the sidewise variations of their positions serve as a guide for the movements of the lever, which is adapted by its swinging movement to vary the time of the instrument, and is provided with an index pointer which overlies the music sheet, the lever being moved by the operator in substantial coincidence with the positions of the numerals upon the music sheet.

The music sheet 38 is mounted in the customary way upon the rolls or spools 39 and 40, which are provided with suitable and well-known winding devices not herein shown, for winding the music sheet from one spool to the other, drawing it across the surface of the tracker bar 41, which is provided with a series of ducts 42, which communicate by means of tubes 43 with the respective note sounding devices of the machine. The aforesaid driving mechanism for the music sheet is usually propelled by a motor operated either by air under pressure, or by atmospheric pressure induced by exhausting the air through the motor. The compressed air is conveyed to, or the exhausted air is drawn from the motor through a supply pipe 45, in which is placed a valve 46, preferably consisting of an ordinary plug cock having the opening 47, which as the valve is turned, regulates the amount of air passing through, and thus controls the rapidity of operation of the aforesaid motor for the sheet driving mechanism.

The valve is provided with a lever 49 having an index or pointer 21, which extends over the music sheet and is provided with a knob or finger piece 37 placed in a position convenient to the hand of the operator. The end 22 of the index is preferably extended to the tracker bar, so that the tempo guide numerals may be placed upon the sheet among the note perforations. The guide numerals are printed or otherwise placed upon the music sheet, and are located thereon in such relation to each other that when the point 22 of the indicator is over any one of them, the small pointer 35 provided at the outer end of the lever 49 stands over the corresponding numeral in the fixed graduated arc 36. The graduations are marked on a plate 50 which is suitably secured to the frame of the machine, and carries near its ends stop pins 29 which limit the swing of the lever 49 in both directions. The guide numerals in the note sheet thus

indicate by the sidewise deviations in their positions the extent to which the lever 19 must be swung to keep the small pointer 35 in proper position on the graduated arc 36, thus suitably varying the speed of the sheet driving mechanism.

The amplitude of movement of the lever 49 required to move the valve 47 from its closed position of Fig. 3 to its open position of Fig. 4 is indicated in Fig. 1 by the dot-and-dash lines 24 and 25; and the range of deviation of the tempo numerals to indicate the extreme variations of speed from nothing up to full speed is indicated by the length of the arc 26 in Fig. 1, indicative of the travel of the point 22 of the index required to produce those variations. When the pointer or index is not thus extended into substantial coincidence with the position of the tracker bar ducts, a corresponding allowance must be made in the width of the range covered by the guide numerals and also in the position in which the latter are placed longitudinally of the sheet, relative to the tracker bar perforations. The numerals must also be laid out with proper reference to the character of the valve employed, and to the form of the opening 47 therethrough; since variations in the form or kind of valve employed will require corresponding variations in the amplitude of the movement of the lever 49, and in the relations of different parts of that movement, all of which are readily understood or easily determined by trial.

In order that the index 21 may readily be swung out of the way to permit the removal and replacing of the music rolls, it is preferably pivoted upon the lever at 28. By swinging the index forward the rolls are made accessible. When the variations of the tempo are frequent, the numerals will appear so near each other longitudinally of the sheet that the operator will have no difficulty in keeping the end 22 of the pointer in the proper positions over the unmarked portions of the sheet between the numerals. When, however, the music is to be played for any length of time at any unvarying tempo, the numeral at the beginning of such a passage may be underscored or otherwise marked thus instructing the operator to keep to that tempo till the appearance of the same numeral unmarked notifies him of a coming change, this unmarked numeral being preferably employed only when its position is in such proximity to the numeral which follows it as to cause the operator no appreciable mental effort in conforming to the change. For example, the index may be retained in the position indicated by the underscored 10 (Fig. 1) until the plain 10 is reached.

Most instruments of this class are operated by a treadle connected with a system of bellows, by means of which a partial vacuum is produced for the working of the note sounding devices; and the vacuum or pressure is produced for operating the motor of the sheet driving mechanism. In some of these machines the desired variations in loudness or softness of the music is obtained by working the treadle faster or slower, the louder tones being produced by the rapid working while the softer tones are produced by slower working. But these changes in the rapidity of the treadle movements usually also affect to some extent the time of the music played, since they also accelerate or diminish the speed of the motor for the sheet driving mechanism unless the latter is provided with regulating devices which may be manipulated so as to compensate for the changes in speed of the pumping operations. Any such variation of the pressure due to changes in the pumping speed for obtaining louder and softer effects should be taken into account in laying out the tempo guide numerals of the present invention, since it may often happen that the louder portions of the music should not be accelerated in time; and should sometimes be played in slower time. Conversely, it may often happen that the soft portions of the music should be played in regular time, or in quicker time, all, of which factors should be taken into account in establishing the range and position of the tempo guide numerals. The lever 49 serves also as a convenient means for starting and stopping the sheet driving mechanism, independently of the treadle or other means employed for working the pumps. By swinging the lever 49 to or past the position of the line 24, so as to move the valve to the position shown in Fig. 3, the motor is at once stopped, and is as readily started again by moving the lever towards the position of the line 25.

Although the guide symbols on the music sheet are preferably the ordinary arabic numerals, it is evident that any other class of symbols, whose sequence is well-known, such as Roman numerals or the letters of the alphabet may be used with equal facility. In Fig. 5 is shown a fragment of a music sheet 32 thus marked with letters instead of numerals.

I claim as my invention:—

1. The combination with means for regulating the speed of sheet driving mechanism, of a music sheet provided with sequence symbols extending in a general direction of the length of the sheet, but deviating from side to side to indicate the required variations of the speed regulating means, the symbols being employed in their sequential order to indicate variations in tempo, the unvarying portions being indicated by a repetition of the same symbol.

2. The combination with means for regulating the speed of sheet driving mechanism, of a music sheet provided with sequence symbols extending in the general direction of the

length of the sheet but deviating from side to side to indicate the required variations of the speed regulating means, the symbols being employed in their sequential order for the varying portions and each unvarying portion being indicated by a repetition, in the same position relative to the edges of the sheet, of the symbol standing at the beginning of that unvarying portion.

3. The combination with music sheet driving mechanism, of a graduated tempo index, a pivotally mounted tempo lever extending backwardly into coöperation with the said index and having a pointer extending forwardly over the music sheet and swinging upon an arc of a radius smaller than that in which the index portion of the lever swings.

4. The combination with music sheet driving mechanism, of a graduated tempo index, a pivotally mounted tempo lever, coöperating with the said index, and a pointer extending over the music sheet and swinging upon an arc of smaller radius than that of the index portion of the lever, the said pointer being hinged upon the lever to enable it to be swung clear of the music paper.

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

JAMES O'CONNOR.

Witnesses:
GEO. D. ANDREWS,
P. WESTERVELT.