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THE MUSIC BOX

a magazine of mechanical music

Vol. 4 No. 7

Keith Harding Antiques

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The Editor writes:

THE SOCIETY has undergone a number of changes since its inception in the early 1960's. We never expected, for instance, that our Society would ever aspire to more than 100 members. Those of us who founded the Musical Box Society of Great Britain had at our fingertips a mass of largely introspective knowledge and experience with musical boxes and the Society gave us the welcome chance to expand ourselves and our interest by sharing data, exchanging information and views. So long as we remained a small group,this type of intercourse was easy to maintain.

An unavoidable result of any expansion of the type which we are experiencing is that much of the personal contact between the committee and the majority of members is hindered both by the geographical limitations and the time factor. This is one unfortunate aspect of our expansion which is no more keenly felt than by myself and the others of your Executive committee and it is one reason why this Journal is of such importance in bringing together the interests and activities of our far-flung membership.

But there have been other changes, too. Perhaps right now no-one has a harder job than Secretary Reg Waylett who has to get to know as many of us as he can and try to maintain some form of personal contact with everybody.

Our Society, as Reg Waylett has said, needs to expand if it is to become better known and if we are to continue to finance an improving Journal. Whilst undeniably good from this standpoint, there is always the risk that the true aims and objects may suffer from changed interpretation. Musical boxes are, as our dealer members are the first to concur, big business. We have to strive to maintain the altruistic *raison d'etre* behind our existence if we are to maintain and, indeed, foster our collective reputation as a knowledgeable body. If we allow our Society name to be used in any way other than as laid down in our articles of association, then we must expect to be discredited. There are too many commerically-orientated societies, thinly veiled as amateur, research or improvement bodies, which exist solely for the professional interests of their members and their personal benefit. Let us not inadvertently start on the slippery slope towards such a hypocritical existence.

Particularly despised in most collective societies are the "amateur dealers" who succeed in antagonising both the true collectors on the one hand and the true dealers on the other. There is, let there be no mistaken impression, nothing wrong with buying and selling to foster the growth of your own collection, but there are those who try to make a sideline living out of dealing and it is often the activities of these which create a bad impression outside the Society, particularly where they may be tempted to use the Society's name as some justification for their existence. We must guard against the temptation of falling into this unethical and unwise trap.

ARTHUR W.J.G. ORD-HUME

Player Organs and their Overhaul

By

Arthur W. J. G. Ord-Hume

SOONER OR LATER, the musical box collector becomes aware that there are other forms of mechanical instrument other than the cylinder and disc-operated comb-plucker. He will find barrel organs, player pianos and player organs all awaiting the opportunity to attract his attention. Strange as it may seem, whilst there is information available to the collector on the restoration of player pianos, there is little or nothing on the repair of its larger sister – the player organ.

Player organs come in two basic varieties – the player reed organ and the player pipe organ. Since the latter instruments are rarely stumbled across by collectors whilst the former instruments abound in greater numbers, this article is devoted to the player reed organ and it assumes the restorer to have a fair working knowledge of the principles of the pneumatic action and the player piano.

Again, to deal in depth with every step of restoration would be a lengthy job and so my writing will deal with (a) how the player reed organ works, and (b) how to take it apart, reassemble it and check for faults.

Let us make a start by detailing these points of similarity between the player-piano and the player-organ. There is the obvious one, of course—both have keyboards and both can also be played manually as well as automatically. Both play music from rolls of perforated paper. Another similarity is that both rely on a difference between the air pressure inside the instrument and the pressure of the surrounding atmosphere. Both, therefore, have foot-operated treadles, or electric motors which provide the necessary pressure differential. Both instruments have a pneumatic system with a tracker-bar as a visible common feature. And both have the familiar spooling and rewind mechanisms. From the point of view of the collector, both are decidedly heavy to try to shift.

These instruments play on reeds and there are three basic makes of player-organ which the collector may come across. First there is the Aeolian Orchestrelle, made in at least sixteen different sizes and styles between 1900 and about 1920. Aeolians also made a Pipe Orchestrelle which was a true reproducing organ. Wilcox & White of Meriden, Connecticut, produced the Symphony which again came in several different sizes and styles. The date of this instrument is from about 1888 to 1900. The Maxfield organ, stemming from the basis of McTammany's patents and the Munroe Organ Reed Co., was a British contribution patented in 1896 and models cost up to £25. The Maxfield, invented by the man who gave us the Celestina organette, played rolls much narrower than the others—only $5\frac{1}{2}$ inches—and was altogether a smaller

instrument, having only 31 of its 61 manual notes automatically operated as compared with 58 notes on both the Orchestrelle and the Symphony.

There were a number of other makes but these are seldom to be found, particularly as they were of such a size that they were nearly always built in to a house to fit the available room, hence their being termed 'residence player organs'. These larger instruments, emanating largely from America, were indeed wonderful things and were classed not only as excellent mechanical organs, but also as first-rate finger organs. Larger examples were fully automatic (stop control and swell action operated from the roll perforations) and had two or sometimes three manuals. Manufacturers included Aeolians with their 65-tracker perforation Universal, 116-hole Double and 167-hole Duo-Art, Welte with their 150-hole model, Skinner with 120 and finally the leviathan Austin Quadruplex, which played rolls 21¼ inches wide and having no less than 240 apertures in the tracker-bar. It is interesting to record that the attendant problems of tracking with so wide a music-roll were solved by making the tracker-bar in five sections, each of 48 holes. The central section was fixed and the other sections could move laterally one way or the other to suit.

But to return to the more common types of player-organ, let us begin by taking a look at how these instruments function and why.

From our knowledge of the action of the player-piano we have learned how air, either at a pressure greater than that of the atmosphere, or at a pressure reduced from that of the atmosphere, can be made to perform certain duties in order to operate the mechanical parts of a playing mechanism in a piano. In the player-organ there are two separate air systems—one to operate the necessary valves and pneumatics to instruct a certain note to speak, and another to provide that note with the ability to respond to the instruction. In the latter system, the air must be used to blow the reed. Both pneumatic systems rely on foot treadles to provide the differing air pressure.

A reed can be sounded only by allowing air to pass through it, but there are two distinct methods by which air can be caused to make a reed produce sound. One is by creating a suction on one side of the reed, so that, when a valve is opened, atmospheric air pressure rushes in, sounding the reed in passing. The other is to create a pressure on one side of the reed so that, when a valve is opened, the pressurized air rushes out to atmosphere, making the reed sound on the way.

This is the basic difference between the harmonium, which blows air through its reeds, and the so-called 'American Organ' which has a more strident or prompt tone because it sucks in air through its reeds. The term 'American Organ' can confuse, however, for both the Aeolian Co. and the Wilcox & White Co. made different models with blown reeds and sucked reeds.

The suction models of these reed organs are relatively simple devices, although it does not necessarily follow that they produce inferior sound. Indeed, my own suction Orchestrelle produces very pleasing music of excellent and varied tonality and is quite up to the standard of some of the pressure models.

In the suction model, air is exhausted constantly from the inside of the instrument by means of large exhausters similar to those used in the player-piano. Because, though, the volume of air at atmospheric pressure released into the inside during playing, particularly when sounding a heavy sustained chord on all stops (i.e. full organ), is quite large, the player-organ has exhausters and a suction reservoir or equalizer which is of considerably larger proportions than that which we are accustomed to finding in the piano.

There is another point to be remembered and that is that the pneumatic system, which forms

part of the automatic playing of the instrument, is also a vital part of the organ for 'manual' playing. One still has to treadle when playing by hand so that there is an air pressure differential inside the instrument, to allow the reeds to speak. From this we can readily see that there must be some form of shut-off or by-pass valve, which cuts out the keyboard for automatic playing, yet may readily bring it back into function whilst at the same time shutting off the mechanical part of the action—that is essentially the tracker-bar and roll-winding air motor.

This dual function is achieved very simply. When manually playing the Aeolian Orchestrelle, a leather-covered bar, normally stowed in the roll box, automatically slides out and covers the tracker-bar holes. As this comes out, under the control of a 'manual' stop knob, a set of small spring-loaded pallet valves are raised *en bloc* to touch the bottom of the keys in the keyboard. When a key is depressed, a corresponding pallet in the system is raised, opening a small piston and plunger in an airway. This allows air to enter a small windway and inflate a pouch on the pouch-board. For manual playing, this piston is controlled by the key as we have seen. When automatically played, the piston and its special pallet is swung away from the keys, the tracker-bar sealing strip moved, and the pouches in the pouch-board become under the control of the perforated music paper over the tracker-bar, as in a player-piano. On the Wilcox & White Symphony suction models, the tracker-bar sealing is effected manually by lifting up a leather-covered bar hinged to the tracker-bar.

The suction system is illustrated in Fig. 1.

Pressure models operate on a different principle. As mentioned earlier, here we have a positive pressure exerted inside the organ to play it. This means certain complications arise in the instrument. Whereas before, with the suction model, the foot treadles worked exhausters which drew air out of a reservoir, which was kept normally open by heavy springs, the bellows now compress air into a reservoir, which is held open against heavy springs by the pressure of air inside it. Added to this, the air motor for driving the roll mechanism is still of the suction type, and has to be driven from the suction side of the bellows. This means that, in order to cater for varying air pressures and to maintain an even motor speed, the motor must be driven through both a knife-valve and its own suction equalizer, controlling, in most cases, another knife-valve. This equalizer on the pressure Orchestrelle is a long, thin air-motor bellows normally held open by 'Y' springs and controlling a valve from an adjustable wire in its centre back-board.

A further problem with the pressure models is that there is no suction to operate the primary pneumatics. Since they cannot be operated by normal atmospheric pressure, the difficulty is overcome by operating the pouches which control the valves by air at pressure. This means that the tracker-bar and music-roll must be contained in an air-tight box, into which air is pumped from the pressure system. Access to the roll is thus achieved by a sliding glass door in this roll box and the instrument will not play with this door in the open position. This pressure supply to the roll box is also equipped with a cut-off valve, so that, for rewinding and for manual playing, a sliding valve can be made to seal the windway. Again, to prevent there being a 'buffer' of air in the tracker-bar and also because manual playing uses separate valves in the windway from tracker-bar to pouch, the tracker-bar is sealed by a leather-covered flap for manual operation as on the suction models.

I am assuming that my readers are conversant with matters concerning keyboard pneumatics and primary valve systems to the point where they can be taken for granted, I shall confine myself to describing the details which are placed above the pneumatic stack and which relate only to the player-organ.

Since the Aeolian Orchestrelle is the most common of the player-organs, and since the basic principles can be applied to the other styles and makes, we will have a general look at the two types of such an instrument—the suction and the pressure.

The suction model comprises a large vertical chest which is divided into narrow, vertical compartments, fifty-eight in number (one for each note of the keyboard), and running from front to back. Along the front of all these vertical compartments is arranged a number of rows of reeds, each reed mounted individually in a wooden cross member and each corresponding with one of the vertical passages. There may be four, six, seven or eight of these rows of reeds and each row comprises reeds of a slightly different form or shape, so as to produce a sound of different characteristic, and the chambers in the wooden cross-members, and in which the reeds are mounted, are arranged to be a different shape in each row, so as to impart different tonal characteristics to the reeds inside. In this way, subtle variations in tonality can be engineered so that one row of reeds sounds entirely different from another—i.e. French Horn, Oboe and Trumpet. Each row of reeds is provided with a hinged, tight-fitting flap which seals off all the reeds and which is connected to a stop knob on the keyboard fascia. When a certain bank of reeds is required to speak, the performer draws the respective stop which opens this hinged flap. Air can now be drawn in through the reeds, when a note is required to be sounded.

Reverting to our large vertical chest divided into fifty-eight compartments, the back of each compartment is sealed by a pallet. In fact, because the vertical passage is so long—about twelve inches from top to bottom—the pallet is made in two halves, put together so that both operate as one. The opening and closing of these pallets is controlled from small pneumatic motors or bellows provided, as in the piano, on a windway controlled by pouches and valves. The difference is that these pouches and motors can be controlled both by the holes in the tracker-bar and also by the keyboard. Between the pallets and the motors run wire pull-downs or, sometimes, cranked rods. All the pallets and, in fact, the entire back of the vertical chest is enclosed in an air-tight casing and the operating rods or pull-downs pass out of this through felt seals on their way to the pneumatic stack. Air is continually exhausted from this enclosed chest. When a note is required to sound and the respective motor collapses, it opens one of the pallets, via the pull-down, inside the chest, which contains air at a reduced pressure to that of the atmosphere. If one of the reed-carrying members on the front of the chest now has its hinged flap opened (by drawing the stop on the keyboard fascia), then air will immediately be sucked into the vertical compartment through the reed. If more than one row of reeds is opened, then air will rush in through several reeds, producing the same note from several reeds of different tonalities.

This chest is supported by, and fixed to, a horizontal platform which is built just below the keyboard level of the organ. Consider, if you like, that this is a table. Beneath the table are fitted the treadle-operated air exhausters and the exhaust reservoir. Above the table is mounted the chest. The airway into the exhaust reservoir is matched by a slot in the table which also matches a slot in the chest, so that the air pressure differential in one is directly united with the other. Part of the air inlet system comprises the air motor, which provides rotary motion to the mechanism for transporting the music-roll, and this is controlled and governed in exactly the same way as in the player-piano.

We will now turn our attention to the pressure-operated instruments, and perhaps the best start is to forget all that we have learned about suction systems and exhausters, for here we are dealing with air at pressure. The action of treadling operates feeders instead of exhausters—feeders which are continually pumping air into a reservoir, which supplies a large quantity of

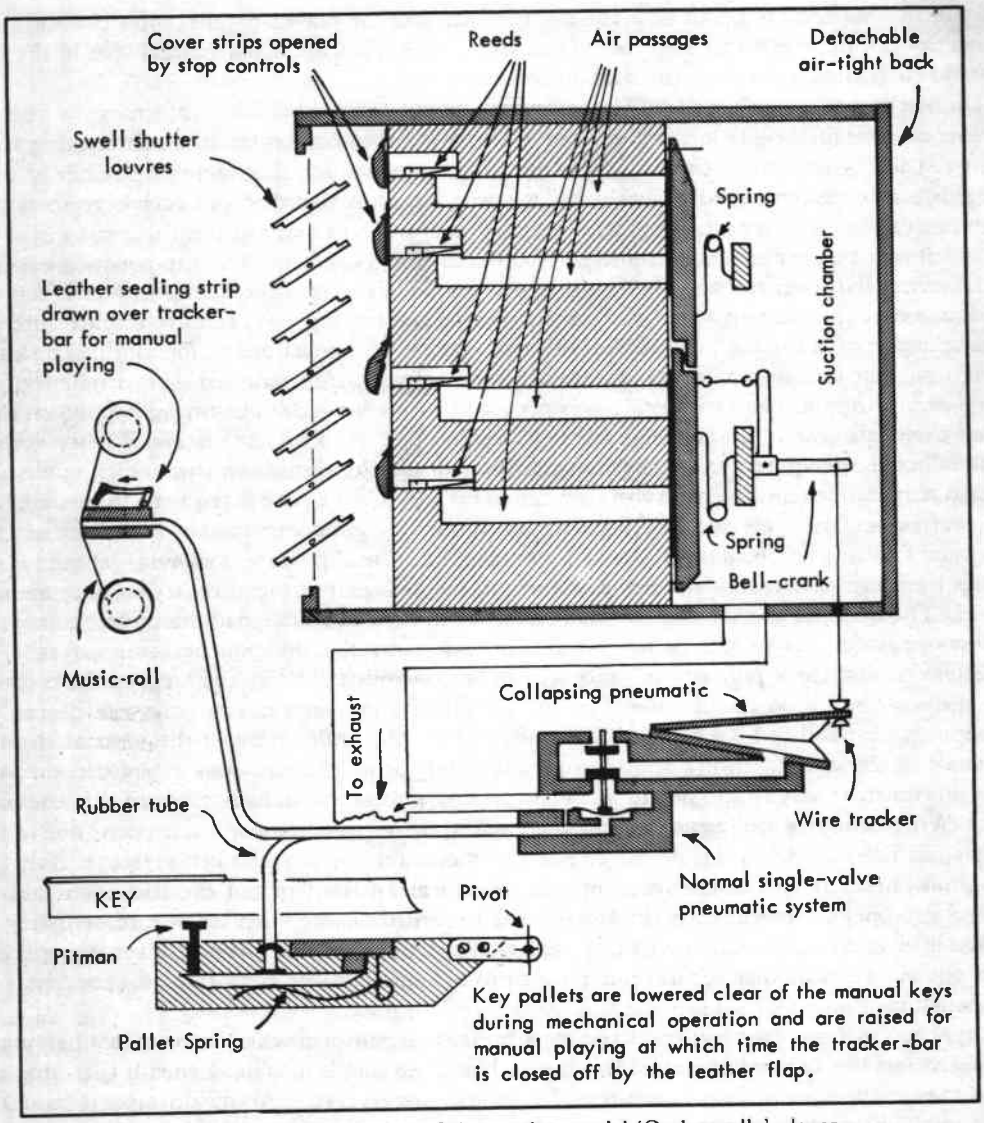


Fig. 1 The operation of the suction model 'Orchestrelle' player organ showing the action for one keyboard note, one rank of reeds open to speak

wind to circulate inside the chambers of the instrument, and by means of which the many reeds can be blown adequately.

The pressure Orchestrelle comprises a table upon which the mechanics of the organ may be located, such as wind motor to drive the music-roll, stop linkages, pneumatic valves and so on. This table also contains the windways for the keyboard operation of the instrument and thus ends with a double, staggered row of pouches along the back edge. Beneath the table is the

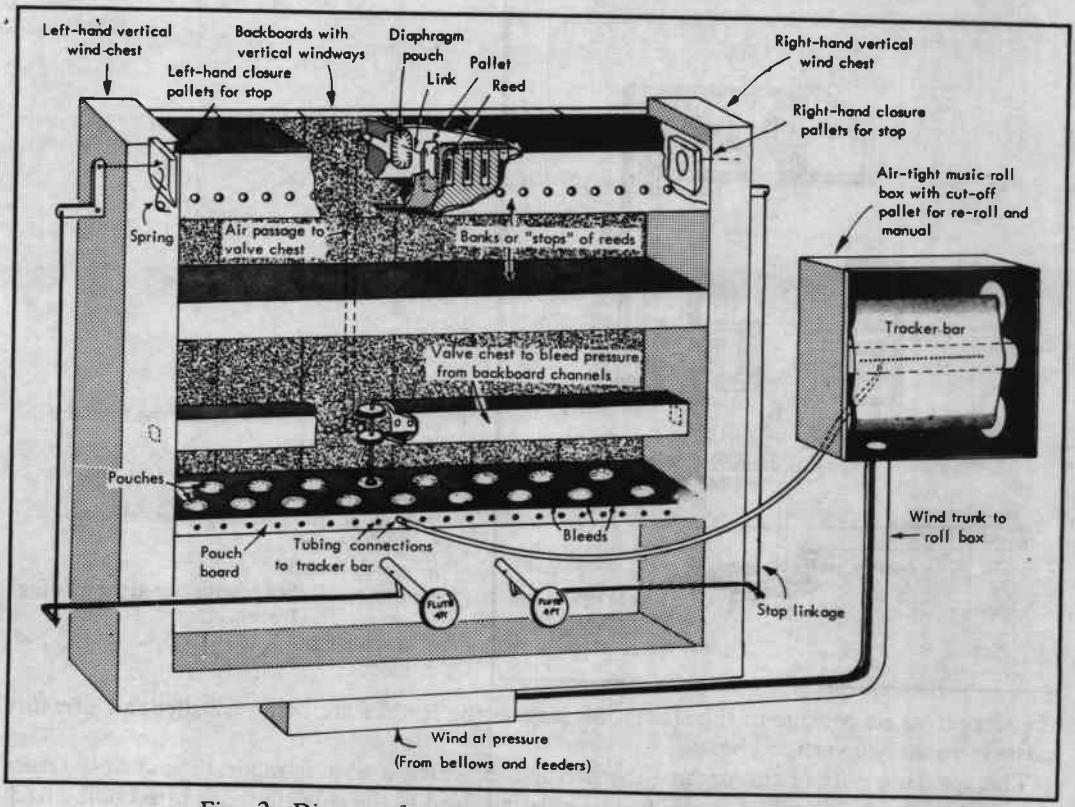


Fig. 2 Diagram of pressure model Orchestrelle player reed organ (only one stop indicated for clarity)

centreboard, having upon one side the wind reservoir and on the other the two treadle-operated feeders. Wind from the reservoir is taken to two vertical trunkings of wood, which run from each end of the table to the top of the instrument. The inside faces of these trunkings have certain openings, between which fit first of all the pneumatic valve stack above the pouch board, and then successive narrow boxes, one on top of the other, each containing one rank or 'stop' of reeds. From this you will appreciate that air is admitted from both of the trunkings to the reed boxes at the same time. Similarly, air is admitted to the pneumatic valve stack from both sides.

The passage of air from the vertical trunking into a reed box is controlled by a large pallet valve which in turn is controlled by a linkage to the stop-knob on the keyboard fascia. As a precaution against excess air pressure in a reed box causing the momentary sounding of a reed in that box, after the stop has been shut off, the stop linkage is also connected to a felted hinged flap, rather like that which we have already seen on the suction models, to cover the air exit from the reeds.

Thus we can summarize the actual speaking part of the organ as comprising two vertical wind-chests, between which are fixed banks of reeds, each bank voiced in a different way. Air is passed into the reed boxes from both ends, and may be shut off by master pallets which close

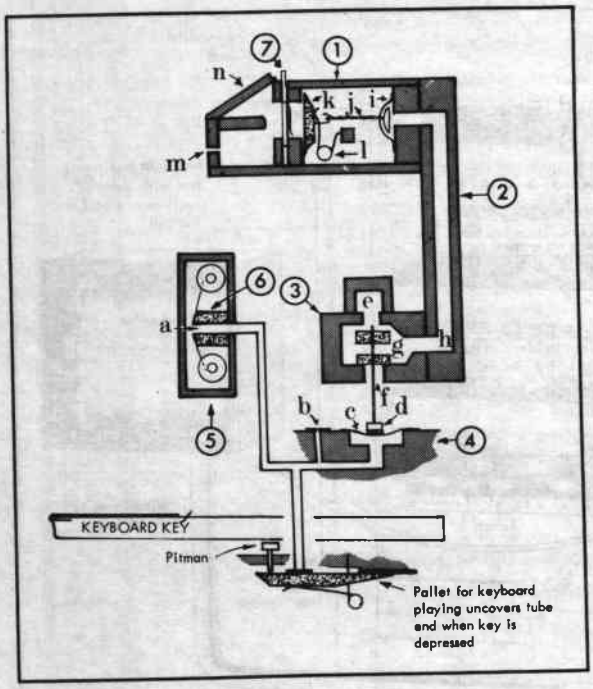


Fig. 3 Detail of the action of the pressure model Orchestrelle.

Key to numbers:

1. one typical reed box
2. back board with individual airways
3. valve chest
4. pouch board
5. music-roll box (with air-tight sliding front)
6. tracker-bar
7. reed

the respective air passage in the chests. So long as the feeders are being treadled, air pressure exists in these two vertical chests.

The speaking part of the organ—the method in which a note is made to sound, is rather more complex. Each bank of reeds, as well as being fixed to the side chests, is fitted to the back of the organ and this back is made up of panels of timber containing vertical passages. Each reed in each bank is matched by an opening in the back of the reed box which matches an opening in the backboard of the organ. At the bottom of the backboard the vertical passages end with another opening, which lines up with openings in the pneumatic valve stack. The purpose of this is that air will be under pressure in the passages in the backboard, at all times whilst the instrument is being operated. When a note is to be played, a valve in the pneumatic stack is pushed up by the pouch in the pouch-board, so closing off the air-pressure inlet to that valve, and opening the backboard passage to atmosphere, so bleeding out its air pressure.

We now have two functions explained—air pressure in the reed box and the exhausting of a column of air relative to every reed, in all the banks of reeds, which represents one predetermined note.

Inside the reed box there are two sections. The first is a section common to all the reeds (this actually is not entirely true as we shall explain further on, but it will suffice to accept this for now) and the other is made up of small compartments, one for each reed, along the back of the box. It is these compartments which are in communication with the windways in the backboard. The compartments are separated from the main portion of the chest by a soft leather diaphragm, into which is cemented a small bearing block carrying a wire hook. Each reed, fixed into the front edge (the common passage) of the reed box, is covered by an inwards-opening pallet and the wire hook is connected to the pallet by a piece of linen thread. Move-

. ment of the leather diaphragm therefore causes the reed pallet to open and shut.

Now we can see how the system works. So long as air exists at an equal pressure inside the reed box and also inside the backboard windways, the reed pallets are kept closed by a light spring. The moment the pressure is exhausted from one backboard windway, all the diaphragms connected to that windway will collapse under the pressure of the air in the reed box, so opening the respective pallet in each reed box corresponding to the note to be sounded. The air pressure can now escape through the reed, making it speak.

The apparent complexities of this system are best explained by illustration Fig. 3 For clarity, this functional drawing shows one particular note (one hole in the tracker-bar) and only one box of reeds. In practice, a number of reed boxes are connected to the backboard airways.

Referring now to the drawing, air chambers (5) and (3) are subjected to air pressure at all times whilst the machine is being operated, i.e. the feeders being treadled or the electric blower in operation. When a stop is drawn, the respective reed box (1) is also subjected to pressure. Chambers (5), (3) and (1) are common to the whole keyboard compass. Airways (a) and (h) are relative only to one keyboard key or one note in the keyboard scale, and each hole in the tracker-bar is connected, via its own airway (a), to its own pouch (c), thereby controlling its own valve assembly (g). This in turn regulates air to an individual passage (h) and operates separate diaphragms (i) and pallets (k).

When the instrument is at rest, meaning when it is not making any sound, the roll box (6), the valve chest (3), the backboard (2) and the reed box (1) contain air at pressure from the bellows. In this state, the lower of the two valves (g) seals the vent (f) to atmosphere, and at the same time pallet spring (l) seals pallet (k) from the reed.

When air is admitted to a pouch (c) through the tracker-bar (a), the pitman (d) is raised, the upper of the two valves (g) closes off pressure airway (e) and exhausts air from the airway (h) through the vent (f). This causes the pouch (i) to contract, thereby drawing open the pallet (k) against the spring (l) via the link (j). In this condition the reed (7) will speak.

To ensure prompt return of the action to silent condition the moment the tracker-bar airway (a) is once more closed, air in the tracker-bar passage is allowed to escape quickly via the bleed hole (b), thereby allowing the pouch (c) to contract under pressure of air from airway (e) on to the upper of the two valves (g). The moment the exhaust vent (f) is once more closed, air is immediately admitted into airway (h), pouch (i) is extended, and pallet (k) closes. Because the pressure in the reed-box is equal to the pressure in the backboard, pouch (i) is free to take up a position on its own, equal to the closed position of pallet (k).

If the action becomes sluggish and cannot produce a rapid staccato, the travel of the valve assembly (g) may be too great, the clearance between (d) and (c) too small, or the bleed hole (b) too small. Because air is admitted at constant pressure through (a) when a note is speaking, bleed hole (b) can be slightly larger than optimum, but, of course, this again may delay speech by making the operation of the valve assembly (g) too slow.

Variation of tonal colour is achieved by the various ingenious methods of mounting the reed (7) in its box (1). A typical installation is shown in the illustration. In this a hinged flap (n) covers the major sound passage. When the reed speaks normally, the sound is allowed to pass into a comparatively large chamber, the only exit from which is a small hole (m). The shape and size of the chamber, the size and positioning of the hole (m) and the relative position of the reed (7) assist materially in providing tonal variation. If the hinged panel (n) is opened, the reed speaks more or less freely to atmosphere through a large chamber, thereby producing a completely different tone.

It will be seen that, regardless of which stops are drawn, the operation of the pouch (i) via the airway (h) continues all the time the instrument is being played. Only when air is admitted into the reed-box (l) will the system speak. The main entry into the reed-box (l) is via a hinged pallet at the sides of the vertical wind-chests. It is these pallets which are controlled directly by the stops.

In dismantling the pressure Orchestrelle, the first point, having removed the upper half of the case, is to take off the back-board. This is actually comprised of a number of sections which fit next to each other. Each section is dowelled with small wooden pegs to the table and is then screwed with a large number of wood screws to each reed box. When removing and replacing these sections, they are a tight fit and you should try not to break the locating dowels, although it is not too important if a few do snap off. Take off the end boards first as these can be reached from the front of the organ with a length of 1 inch square wood. The boards can be tapped free of their dowels, using a mallet on the piece of wood. Remember that these boards are laminated into windways and are thus not as robust as they appear, so do not use excessive force in tapping them free. The boards are all numbered, but it is as well to make your own mark to ensure that they go back in the same position. Each of the screws has a washer under its head and all these screws and washers should be kept separate from other screws.

With all the back-board sections off, unscrew the side panels from the vertical side chests. This allows access to the screws which secure each end of each reed box to the chests. Some of these reed boxes are very heavy—you will see that they are asymmetric in shape and each one differs in shape and proportions. Have someone support the weight of the boxes one at a time, starting from the top, as you unscrew and remove each of them. Note that there is a soft leather seal between the ends of the boxes and the mating portion of each chest. If this sealing gasket is broken, then it must be replaced, using soft white skin available from an organ-builder. So long as the gasket is not too hard, you can reconstitute it by brushing with a stiff wire brush, to restore the knap to the leather. The same treatment should be applied to all pallets which are disturbed or which look as if they are not able to seal properly. The ideal is to replace all leather pallet faces but this is not always essential. Having removed all the reed boxes, the last item to be removed is the pneumatic valve stack and this needs to be handled carefully, as otherwise it may puncture the pouches or bend the valve stems, unless lifted straight out once the screws have been removed.

The sequence of reassembly is the reverse of dismantling and the first item to be replaced is the pneumatic valve stack.

The adjustment of the primary valves tends to be critical. Assuming that the leather of the pouches is in good condition and supple enough, and also that the small, circular pressure pad, cemented into the centre of each pouch, is present, the clearance between the bottom of the valve stem and the top of the pad must be about $\frac{1}{32}$ inch and certainly no more than about $\frac{3}{64}$ inch. Since the valve stems are threaded in the actual valves, it is possible to screw the valves down to this clearance, extremely precise though it may sound. In this position of rest, the bottom of the two valves on the stem must seat evenly on the vent hole of the valve chest. The top valve must be open between $\frac{1}{16}$ inch and $\frac{3}{32}$ inch, for proper operation. These valve adjustments must be made with the pneumatic stack properly fixed in its final position, between the vertical side chests. Since there are two distinct pneumatic systems in the organ—the keyboard and the mechanical—the operation of these valves can be checked before the back-board is replaced and, if the organ has been fully dismantled, before the reed boxes are fitted. All you must do is make sure all the other air vents in the vertical chests are closed and then

have someone select 'manual' on the stops and depress each note on the keyboard by hand, whilst pumping the feeders. You can now watch the functioning of the pouches and valves from the back, making any necessary adjustments as you go. Ensure also that all the bleed holes are clear of dirt or other obstruction, and see that the valves move freely in their guide rails.

Having completed the adjustment of the valves, proceed with replacing the reed boxes from the bottom upwards, again having somebody take their weight until the side screws are in place. Once all the boxes are refitted, you can turn your attention to the pieces which form the backboard. See that all the circular leather or fibre washers, which are placed around each opening, are present and in good order. Tease up their surfaces with the wire brush. If one is missing, before replacing it, make sure that it has not stuck to the matching hole in the reed box.

Position the centre section of the backboard first and replace all the wood screws loosely. Now position both the end sections and again put back the screws finger-tight. The remaining boards are next put back, if necessary carefully springing them into place. Only when all the screws are already in position loosely, should you start to tighten them up. You will find that each reed box has two rows of screws, one along the top of the back edge and one along the bottom of the back edge. Tighten the screws for each box alternately, one top, one bottom, one top, and so on all the way along in a zig-zag fashion. When all the boxes are secured in this manner, tighten the intermediate screws. Make sure all are firmly home. The remainder of stripping, servicing and reassembly is straightforward.

Earlier, mention was made of the fact that the reed boxes receive air from both ends of the vertical wind-chests. This is correct but the reed boxes are, in fact, divided into two unequal portions by a thin plate of steel, which is placed between the twenty-first and the twenty-second note up from the bass end of the keyboard—the A below middle C being the first of the upper division and the immediately preceding G being the last of the lower division. This break in each rank of reeds enables the performer to make subtle use of his controls to play music with a 'heavy' bass accompaniment on several stops, whilst at the same time playing the melodic tenor and treble theme on a 'solo' stop. The converse of the technique is also possible, bringing out the melody on several stops whilst sketching in a soft bass on different stops.

The break in each bank of reeds is therefore used to achieve two stops from each bank. To explain this, one rank may be divided so that the upper portion is controlled by a stop marked 'Oboe', whilst the lower is controlled by a stop marked 'Bassoon'. This represents a fairly logical tonality between these two instruments of the orchestra. Another rank will be divided into 'French Horn' at the upper part and 'Gemshorn' at the bass, whilst another may be 'Cremona' and 'Melodian'. The performer may choose to have all three upper parts of the reed boxes playing, whilst he may select only 'Gemshorn' out of the bass portions to bring in a bass which may not drown the music. This characteristic, of breaking the rank of reeds into two separate stop controls, is also found on the suction models but, of course, there, the reeds are all mounted together into the vertical common chest and only the cover strips need to be divided.

The player-organ has several other features such as a 'Vox Humana' stop, which controls a small air turbine which can be set to revolve in the upper portion of the reed boxes adjacent to the reed openings of one rank of pipes. This turbine turns a paddle which breaks up the sound and produces a wavering effect on each note. Another feature is the 'Swell', which consists of a number of closely-spaced louvres or venetian blind shutters which close off the entire front of the organ inside the case. When these shutters are closed, the organ speaks

quietly or muffled. By opening the shutters, the volume of sound can be made to increase. The swell is controlled by a knee-board worked by the right knee of the performer. A further feature is the 'Full Organ' or 'Great Organ'. This is worked by a knee-board for the left knee and as it is moved, it takes control of all the stop linkages and gradually opens up each stop. So long as this board is held over by the knee whilst treadling, all the stops are open and free to speak, regardless of the stop knobs which are drawn. As the board is released, so the stops close, leaving once more only those for which the knobs are drawn.

Armed with this explanation of the operation of the player-organ mechanism, the repairer should have a fair idea as to how he should set about repair and restoration. As a guide, here are the principle snags which you are most likely to find, together with the correct action to take:

When played manually, one or more notes sound continuously. This can be due to one of three things: (a) the key sticking in the down position, (b) the pallet beneath the keyboard, which operates for manual use, has a loose or broken spring, (c) there is a hole in the leather sealing strip over the tracker-bar or it is just not seating properly. It can also be due to a perforated rubber tube or a missing tube.

When played from the roll, one or more notes do not speak at all, even when sustained. This means that either there is a broken tube connection, the tracker hole is blocked (it should be sucked out with a pump), or the valve clearance is incorrect. It could also be due to a perforated pouch.

When played from the roll, one or more notes are slow to speak. This means that the bleed holes are too large or the valve clearance is too great.

When played from the roll, one or more notes are prompt in speech but will not repeat staccato, producing one long note instead or a number of short notes. This means that the valve clearance is too little or the bleed holes too small.

When one note speaks, an adjacent one 'whimpers'. This means that air from one windway in the backboard is getting through to another windway, and can be due to the board not being tightly screwed to the reed boxes, dirt trapped between backboard and reed box so preventing it from being tightened properly, or the small leather washer between reed box hole and backboard hole being torn or missing.

Organ will not play at all mechanically. This means that the keyboard manual-playing stop-knob is disconnected from the keyboard manual-pallet rail underneath, so leaving open both the mechanical airways in the tracker-bar and the key pallets.

When played manually, certain notes suddenly begin to screech. This means that a pallet is not closing in a stop. A common feature amongst suction organs, this can be rectified by locating the reed, and then removing the controlling pallet at the back of the vertical chest and either re-leathering the sealing face, or teasing it up with a fine wire-brush.

Air motor to drive music-roll is sluggish, erratic or inoperative. This can be due to damp affecting the sliding seals, a disconnected airway, or the control valve being disconnected.

On pressure models, the rewind for the roll is very slow and requires heavy treadling. This is due to the shut-off valve, which cuts air pressure from the roll box, not closing properly. With the roll box open, the rewind will speed up, but air is still being wasted. If you can hear and feel air at pressure coming from the windway into the roll box during rewind, remove the cover of the box (it is attached with simple hooks along all sides) and check the operation of the valve when the 'rewind' stop-knob is drawn. If it does not fully close, then adjust the linkage until it closes properly.

If the organ plays on rewind. This is exactly the same as on the player-piano and the same valve selector adjustment should be carried out.

If a reed suddenly produces a muffled, flat tone. This indicates either that a piece of dirt has got on to the reed, or that it has fractured through age. Draw out the reed with a reed hook (use this tool carefully and engage it only in the recess provided, otherwise the reed tongue will be damaged) and examine it. Holding the reed up to the light, you should be able to see an equal amount of light between the tongue and the plate all the way round. Use a soft brush to clean away any dust and dirt. If the reed still sounds flat, then it is probably cracked. Some cracks are almost impossible to see, even with a magnifying glass. A cracked reed must be replaced. Most large piano-sundries houses also carry reeds and, if they cannot match it with an entirely new reed, they can fit a new tongue and re-voice the old one for you, if you send them also the reed an octave above and an octave below the damaged one.

It goes without saying that loose, cracked or otherwise damaged rubber tubing will have a serious effect on the performance of the instrument. Similarly, the feeders, equalizers and exhausters and pressure reservoirs must be in good order and free from cracks and leaks. The main reservoir is covered with a rubberized cloth, considerably thicker than that used in the player-piano, and if you have to re-cover, use material of the same thickness and quality, matched from the piano-sundries house. NEVER USE THINNER MATERIAL—it just will not last.

With this résumé of the works of the player-organ, the amateur should be able to solve his overhaul problems, once he understands the principles of the pneumatic player action common to both piano and organ.

A final word on a subject which, I know, causes much confusion, misunderstanding and speculation. The novice to the organ may be perplexed by some of the terminology used to describe the organ stops as written on the stop-knob faces. He will probably see 'Bourdon 16 ft.', 'Trumpet 8 ft.', 'Flute 4 ft.' and, on some of the larger instruments, 'Piccolo 2 ft.'. He may deduce these dimensions to refer in some way to the reeds or to the reed boxes. In truth, he has no need to concern himself with this part at all. What significance the dimensions have, will become apparent when he begins to play his newly-restored instrument. Suppose you start by drawing 'French Horn 8 ft.', in the upper part of the organ, and matching it with 'Gemshorn 8 ft.', in the lower. If you now play manually, you will find you have a complete scale. You can now select two more stops, again marked '8 ft.', and you will find that this second rank of reeds produces a unison sound—in other words, sound at the same pitch although of a different character. Now pull one of the bass stops marked '16 ft.' and you will find that the bass notes are suddenly reinforced with notes sounding an octave below the others, in other words you are playing two notes, an octave apart, from one key.

On the treble register, you draw a stop marked '4 ft.' and find that you are now playing two notes from one key; this time the '4 ft.' stop is producing a note an octave above the normal. If you draw a '2 ft.' stop, you are an octave above that again, or two octaves above the first note you played with that same one key.

Thus the dimension is related to the pitch of the note. The larger number of stops are marked '8 ft.', so the organ is said to have 'a basis of eight foot pitch'. If you double the number, i.e. 8 to 16, then you decrease an octave from the normal. By halving again, from 4 to 2, you have progressed two octaves from the normal, which is 8.

This characteristic, based on the physical dimensions of a proper organ pipe, and the terminology of a real pipe organ, allows subtle tones in the performance of a music-roll. You

can, for example, accentuate the melodic line of a tune by playing it in 'octave unison' in this manner. Likewise, you can accentuate the bass by bolstering up a nominal 8 ft. with a 16 ft. stop.

The middle C on an 8 ft. organ stop is equal to the middle C of the piano, and for this reason a piano is said to be of 8 ft. pitch.

The art of playing the player-organ is perhaps more aesthetically satisfying than that of the player-piano. The skills needed are just as involved if you are to produce a perfect performance. The novice may scoff at the thought that there can be any skill needed to get an interpretation from a roll of music on such an instrument. Give him ten minutes with one though, and he will be a wiser man, if no more technically competent. But the art, for art there is in playing both piano and organ from roll music, is a true art with its own fair share of fundamentals, mechanicals, abstracts and sympathies, and to attempt to do justice to it would require an altogether separate, lengthy work. To some, I am certain, the art will need no interpretation, for the mere possession and fulfilment of such an instrument will cultivate an understanding tantamount to the art spontaneously. To others, it may forever remain a murky mystery.

THE STORY OF A BANNED POLYPHON DISC

By Arthur W.J.G. Ord-Hume

SOME WEEKS AGO, I was standing in Gerry Planus's fascinating shop off the Portobello Road, glassy-eyed and clutching a very hot cheque-book. Now Gerry has had a succession of "fascinating shops". First there was one in the Old Kent Road where, behind the respectable air of a sewing-machin-mongers there lurked a mine of musical boxes and automata Then there was one in Deptford High Street where, behind the cover of more sewing-machine-mongering, rabid musical box enthusiasts would huddle in the back room to murmur, in awesome tones "Listen to the bass!".

But this is the age of permissiveness. Musical boxes can now be brought out into the open without fear of corrupting the hi-fi enthusiasts, TV-addicts and the winsome blondes who would enter the shop on the pretext of feeling a sewing-machine just to hear the sounds of " Home, Sweet Home " on a Nicole filtering through the Woodbine smoke from the back room. And so Gerry now has a shop full of the real stuff - clocks and musical automata.

To return to the story. For some many moons, I had been eyeing a pile of Polyphon discs which had been stored on the floor. Over the months, they had accumulated dust, dirt, bits of clocks, cigarette ends and suchlike and any suggestion that they might be for sale had been greeted with one of those large Gerry-type smiles and some comment such as "You don't want to buy them!" On this day, though, Gerry was having a sort-out and the said discs were now neatly stacked and tied up with wire. I'm not certain wether Gerry took pity on me or wether he was just hard up on that warm summer Saturday morning, but on this occasion they were actually for sale! I sorted through them and selected a back-breaking pile of music which I reckoned would justly supplement my already large collection of 19-5/8" discs. Among these, I was delighted to find what must be one of the scarcest of Polyphon discs - number 5099 "March Lorraine".

This disc was issued in the mid-1890's and immediately created an outcry which was to terminate in one of the biggest copyright cases of the era. The Polyphon Company of Wahren, Leipzig had, it seems, made its arrangement of this famous march and issued the disc without having first entered into any arrangement with the owners of the copyright, the Brunswick firm of Henry Litolff's Edition, which had purchased the rights from the French composer, musician Louis Ganne.

When first the case was heard, the copyright owners pressed for the imposition of a fine and the confiscation of all discs and their

master. Polyphon took the case to the highest court - the Reichs Gericht or supreme court of appeal. Here, throughout the winter of 1898/99, the court deliberated on the case and finally the motion for the imposition of the fine was dropped, but it pressed for the confiscation of the discs "together with the appliances necessary to their production".

The defence set up was noteworthy and the case created a precedent. As a French author was not protected, even in his own country, against the unauthorised use of his composition, the whole case, it was argued, was irrelevent. However, it was provided by Act 11, Section 1 of the Bernese Convention, as the outcome of an earlier proviso. that a French author and his legal successors would have in Germany the same rights as a German author.

Faced with this, the Royal District Court of Leipzig ordered the confiscation of both discs and the master plates, this confiscation extending to all discs made and delivered to other firms and agents.

In appealing to the Reichs Gerichts and having its appeal dismissed, the Polyphon Musicwerke found itself the instrument of a test case which was to set a legal precedent for the lower courts.

Since the copyright laws if the time were interpreted and abbreviated to suit the whims of the German mechanical music industry in the same way as was much of the music which it used, it was not surprising that Paul de Wit, renowned editor of *Zeitschrift fur Instrumentenbau,* should see this outcome as an evil which he thought must be remedied. He did in fact press for new legislation, alleging that, as Germany surpassed all other countries in the world as the producer of mechanical musical instruments, the same protection should be granted at home as was accorded to this industry in other countries.

Whether with the wisdom of hindsight one is today able to excuse the practice of plagiarizm which was so widespread at this time is another matter. What is certain , though, is that without it the repertoire of so many of the musical box manufacturers' disc catalogues would have been considerably smaller.

This case, one of the earliest and certainly the biggest of its period, is matched with the later test case of Boosey v Whight regarding the transcription of music for instruments playing perforated paper rolls. But that is another story.

For the time being, then, I have my copy of the banned disc and it would be interesting to know how many other copies exist - there must be quite a few for it was in circulation for more than a year. As Gerry Planus said when I told him of my find "It just goes to show that there are still collector's items to be found....".

A letter from the President of the Society, Robert Burnett:

DISSATISFACTION WITH THE RUNNING OF THE SOCIETY

Reference was made in the last issue of the Journal to dissatisfaction with the way the Society is being run which was expressed by some members at the last Annual General Meeting on 16th.May 1970. This is a matter of very deep concern, both to myself and to other members of the Committee and, since the A.G.M. it has been discussed twice by the Committee at meetings called specially for this purpose. I believe therefore it may be desirable that a full statement on the position should be published in the Journal for the benefit for all members.

By the Constitution, the Officers of the Society and the Committee Members are elected annually at the A.G.M. The Constitution also provides that all nominations must be sent to the Secretary six weeks before the A.G.M. so that he can circulate their names to all the members four weeks before the A.G.M. As is normal with very many societies, nominations for the Officers and Committee Members are made by the Committee, though this in no way precludes ordinary members from making whatever nomination they may wish to. In fact, over the past few years, no nominations have been received from the ordinary members and the Committee's nominations have been automatically elected without the need for a vote.

At the last A.G.M. the position was the same as on the previous years with no nominations received other than those of the Committee, but unfortunately, one of the Committee nominations for Committee membership, Mr.Graham Webb, withdrew and the Committee's nomination for Vice-President, Mr.Jocelyn Walker, decided that his length of membership of the Society and knowledge of the subject were not sufficient to warrant his accepting the office of Vice-President, although he would be glad to remain a committee member. Both of these withdrawals took place after the Committee's nominations had been circulated to members, but before the A.G.M.

In these circumstances the Committee felt that it ought to put forward another nomination at the A.G.M. to replace Mr.Webb, very kindly, Mr.Entwistle accepted the Committee's nomination at rather short notice. In the absence of other nominations, the Committee's nominations, including Mr.Entwistle, instead of Mr.Webb, were elected at the A.G.M. without a vote. The position of Vice-President was left open, because the Treasurer had declared his wish to retire and the Committee felt that, if a new Treasurer was appointed, this might affect the appointment of Vice-President. In fact, some discussions had already been held with Mr.David Shankland, who subsequently accepted the office of Treasurer.

The Officers and Committee Members, elected at the A.G.M. were, therefore,

President..... R.Burnett.
Vice-President. Open
Secretary..... A.R.Waylett.
Treasurer..... D.A.R.Tallis.
Editor..... A.W.J.G. Ord-Hume.
Committee..... J.Entwistle.
J.Walker.
P.D.Ward.

The burden of the complaints made by members at the A.G.M. was that, with a late vacancy occurring in the nominations, members should have been notified of this or given the chance to nominate someone at the A.G.M. It was also suggested that the rule in the Constitution whereby nominations must be sent to the Secretary six weeks before the A.G.M. made it difficult for members to submit nominations.

As I have said earlier, both the other members of the Committee and myself are very much concerned that the Society should be run in a way which is to the satisfaction of the all the members (insofar as that may be possible). At the two meetings held specially to consider the matter various possible changes were considered, including changes in the Constitution to reduce the six-week period of notification of nominations. These possible changes were mentioned in the last issue of the Magazine.

At the second special committee meeting the final conclusion, reached after very protacted discussion, was that we should not seek to change the Constitution, which left members quite free to nominate candidates for any position on the Committee, provided they did so six weeks before the A.G.M. It was decided, however, that, to facilitate nominations by ordinary members, a warning of the date by which nominations must be sent to the Secretary should be given in the latest number of the Magazine to come out before this date and that this date should also be announced at the Winter Meeting of the Society.

The particular circumstances which led to the recent dissatisfaction were the withdrawal of one of the Committee's candidates between the time of his nomination and the A.G.M. It was felt that this represents a special set of conditions which are extremely unlikely to recur. No provision for a recurrence should therefore be made in the Constitution, though if these circumstances should recur, arrangements would be made to allow later nomination by members for the vacancy occurring.

PATENTS FOR INVENTIONS

ABRIDGMENTS OF SPECIFICATIONS

CLASS 88 (i)

MUSICAL INSTRUMENTS, AUTOMATIC

PERIOD—A.D. 1909-15

LONDON:
PRINTED BY HIS MAJESTY'S STATIONERY OFFICE
PUBLISHED AT THE PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS,
CHANCERY LANE, LONDON, W.C.2.

1921

NOTE

A source of reference material for the mechanical musical instrument enthusiast and historian is the records of the Patent Office. Here lies recorded every patent ever issued in England regarding musical boxes, automata, player pianos, organettes and so on.

Up until the end of 1909, all patents concerning musical instruments, both mechanical and otherwise, were classified under Section 88. Starting with 1909, however, a new classification system was introduced which divided the subject of Musical Instruments into two sub-divisions. The sub-division which interests us is Class 88 (i) – Automatic.

It is intended to reproduce the Abridgement of Specifications of all automatic musical instruments dating back to the earliest eighteenth century patents. However, the task of sorting these from the bulk of patents covering ordinary musical instruments is one which will have to be deferred for a while. Therefore THE MUSIC BOX is starting by reproducing, with grateful acknowledgement to H.M.S.O., London, and the Patent Office, London, patent abridgements from 1909 onwards.

In using these abridgements, the Subject Matter Index covers the years 1909 to 1915, as does also the Name Index. In this issue, THE MUSIC BOX looks at the year 1909. The years 1910 to 1915 will be examined in further issues.

One word of special warning. The name under which a patent is registered, unless it is identified as either a company name or as a representative of a company name, is likely to be that of the acting patent agent responsible for arranging the registration. This is particularly common with foreign inventions protected in England with a British patent. The complete specifications of all patents can be obtained from the Sale Branch of the Patent Office price 4/6d each. To order a patent specification it is only necessary to quote the *year,* the *number* and the *name,* i.e. "1909, 4532, Gittins, C.E."

EXPLANATORY NOTE

The contents of this Abridgment Class may be seen from its Subject-matter Index, which includes all index headings, subheadings, and subdivisions allotted to this Class, as well as cross-references under them, although there may be no cases affected within the period covered by this volume. For further information as to the classification of the subject-matter of inventions, reference should be made to the *Abridgment-Class and Index Key*, published at the Patent Office, 25, Southampton Buildings, Chancery Lane, W.C.2.

It should be borne in mind that the abridgments are merely intended to serve as guides to the Specifications, which must themselves be consulted for the details of any particular invention. Printed Specifications, price 1*s*., may be purchased at the Patent Office, or ordered by post, no additional charge being made for postage.

SUBJECT-MATTER INDEX

Abridgments are printed in the chronological order of the Specifications to which they refer, and this index quotes only the year and number of each Specification.

(563) Wt. 32763—2778 500 11/31 H. St.

NAME INDEX

The names in *italics* are those of persons by whom inventions have been communicated to the applicants for Letters Patent.

ERRATA

Page 49. Abridgment No. **19,320.** Add *Reference has been directed by the Comptroller to Specification* 18,476/10.

Page 52. *Delete* Abridgement No. **24,370.**

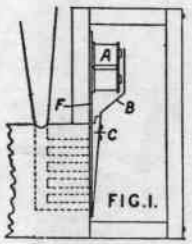
CLASS 88 (i).

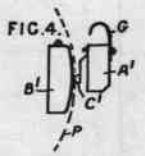
MUSICAL INSTRUMENTS, AUTOMATIC.

Patents have been granted in all cases, unless otherwise stated. Drawings accompany the Specification where the abridgment is illustrated and also where the words *Drawings to Specification* follow the date.

A.D. 1909.

91. Thomas, F. J., and Hine, J. J. Jan. 2.

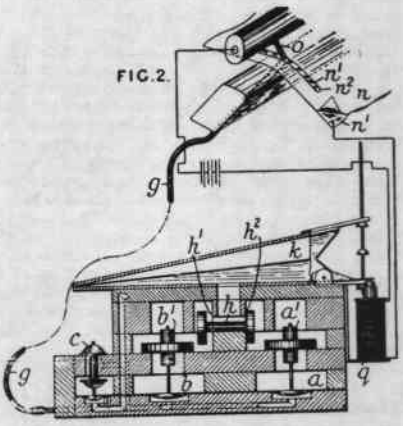




Actions; tracker-bars. — In an automatically-operated organ, the pallets C, which hang vertically downwards, are hinged by leather or other strips F and are provided with armatures B, which are attracted or released by electro-magnets A. The contact-device for completing the circuits of the electro-magnets A comprises two bars A^1, B^1, the bar A^1 being suitably hinged and provided with contact-fingers C^1. As the tune-sheet P passes between the two bars, the fingers C^1 pass through apertures in it, and make contact with the bar B^1, thereby completing the circuits of the electro-magnets A. A guard G encloses and protects the wiring leading to the electro-magnets A. A cylinder carrying pins may take the place of the tune-sheet.

535. Trist, A. E., and Trist Piano Player. Jan. 8.

Actions; expression, controlling; tune-sheets.— In a piano-playing mechanism, two sets of primary and secondary valves are used, one of which controls a higher pressure or vacuum than the other, and a valve *h*, which is automatically operated by the pressure or suction, is adapted to cut off the



note-operating pneumatic *k* from either the channel *a* or the channel *b*, according to which set of valves is operated. The tune-sheet may be of the kind described in Specification 709/06, and comprises a conducting sheet n^1 and a non-conducting sheet *n* which may be cut away to permit the brush *o* to complete the circuit of the electro-magnet *q*, which operates a valve admitting air to the secondary valve *c*. The tertiary valve a^1 is thereby raised in

the known manner, and the valve h closes the port h^1 and opens the port h^2 to connect the pneumatic k to the exhaust channel a. If a note is to be accentuated, a hole n^2 is cut through the tune-sheet to admit air through the pipe g to a primary valve (not shown), thereby operating the secondary valve b^1 to connect the pneumatic k to the exhaust channel b. To sustain an accentuated note a hole n^2 may be followed by a conducting portion n^1 as shown. Pistons sliding within metal or vulcanite cylinders may be substituted for the pneumatics k, the secondary valves being arranged in staggered rows on either side of the pistons.

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685. Sapper, C. E. Jan. 15, 1908, [*Convention date*].

Combined with skipping-ropes.—The handles of a skipping-rope contain musical boxes which are operated by the swing of the rope. The handle 1 has an enlarged end 8, provided with a plate 6 carrying teeth or vibrators 10. The rope is secured to a crank 12, which turns in a bearing in the end 8 of the handle. A picker 17 is secured to the crank-shaft in contact with the face of the plate 6, and has inclined wings 19. When the rope is in use, one wing of the picker plucks the teeth 10, causing them to give out a musical sound.

FIG. 2.

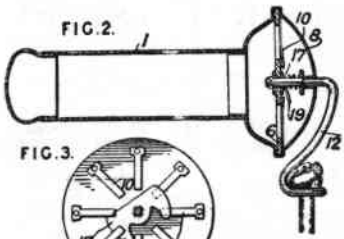


FIG. 3.

1156. Grimsdale, W. H. Jan. 16.

Actions; expression, controlling.—In a pneumatic piano-player, the strength of individual notes is varied in accordance with the size of the music-sheet apertures by employing valves of balanced construction in the passages leading to the striking-pneumatics. Each primary pneumatic opens the corresponding valve to an extent depending on the amount of air which enters the tracker-duct. In consequence of its balanced construction, the valve g, h, Fig. 2, is not subject to the usual initial restraint due to the difference of pressure between the suction chest c and striking-pneumatic b, and it opens therefore to an extent which is determined only by the expansive force of the primary pneumatic f and the opposition of the spring r. After striking a note, the pneumatic b is flooded with air by a bleed-hole t and valve s; or the bleed-hole may be dispensed with, the valve s being constructed in a balanced form and connected to the valve g, h. The valves g, h may be at opposite ends of a lever, or may be hinged and connected by a link. A valve is shown in Fig. 4 having a boss to graduate the aperture it produces on opening.

FIG. 2.

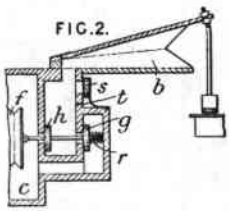
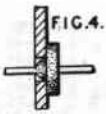


FIG. 4.



1439. Atkinson, C. W. Jan. 20. [*Cognate Applications*, 1807/09, 1809/09, and 6403/09.]

Player-pianos; actions; bellows, arrangement of; cases; winding-mechanism; wind-trunks.—In a pneumatic piano-playing mechanism, the pneumatics are arranged beneath the key-bed, and operate the keys b, c through rods d; the winding-rollers u^1, the tracker-bar u^2, the reservoir u^3 and the bellows u^4 are arranged in or upon an independent casing, which is hooked on to the plate o. This plate is fixed by means of pins to brackets, bolted to the key-bed, and forms part of the casing p which is mounted on trunnions k, so that by pushing the whole action backwards, it may be disengaged from the keys and folded down about its trunnions. The other casing is provided with a front plate t^3 having apertures u, w, which are connected to the tracker-bar and the bellows respectively; these apertures are adapted to coincide with corresponding holes in the plate o, which are connected to the primary pneumatics l^2 by pipes q, and to the wind-chest h by flat wind-trunks n. The metal wind-chest h is of stepped formation and

carries metal tubes g^1, on which are mounted the pneumatics. Each of these consists of two narrow dished plates g^2, g^3, to which flexible material g^4 is attached, either by means of cement or by wire inserted in grooves g^5 round the edges of the plates, as shown in Fig. 7. Each primary

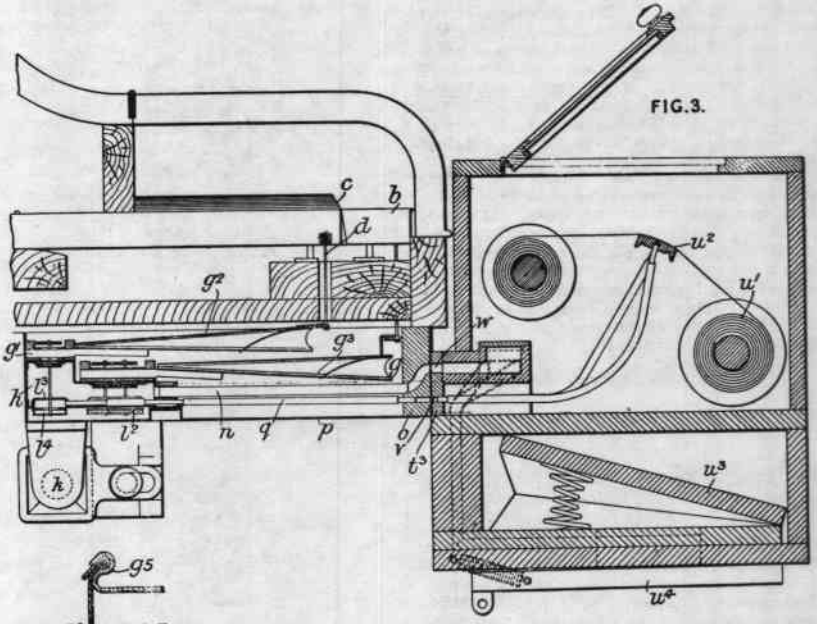


FIG.3.

FIG.7.

pneumatic l^1 comprises two circular dished plates l^3, l^4, to which the flexible material is attached in the manner described. The upper plate l^3 fits into a conical seating in the wind-chest and forms a guide for the valve stem.

1808. Atkinson, C. W. Jan. 25.

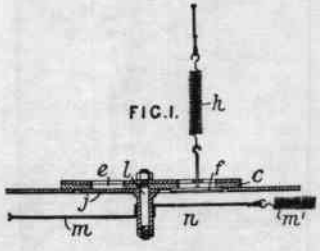


FIG.1.

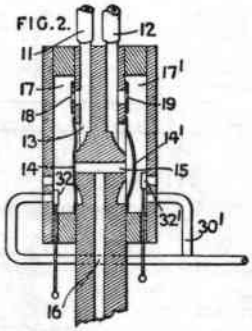
Blowing and exhausting air; expression, controlling.—In a piano-playing mechanism, a spring-pressed valve j is interposed between the action and the exhaust-chest n, causing a definite reduction of pressure which varies according to the tension of the spring h, there being thus no governor action, or tendency to maintain a constant suction in the pipes leading to the power pneumatics. The tension of this spring may be regulated from the control-board of the instrument. To accentuate one or more notes, a lever, which is operated through the cord m, opens the sector valve j, thereby connecting the action to exhaust through the port e. This valve is returned to its normal position by the action of a spring m^1. A seating c of leather or felt is provided for the valves, and flap or sliding valves may be substituted for the forms described. The operation of the valve j may be controlled from the tune-sheet, and several sets of valves may be provided to control different sections of the notes.

562

2378. Dickinson, J. H. Feb. 1.

Tracker-bars.—In an automatic musical instrument, the tracker-bar is provided with two series of ducts for tune-sheets of different compasses, and sets of pipes, such as 11, 12, connect these ducts to two series of chambers 13, one series of which may be put into communication with ducts 16 leading to the action. If the valve 32 is in the position shown, the chamber 17 is open to the atmosphere so that the diaphragm 14 is pressed against its seating. The chamber 17, on the other hand, is connected to exhaust through the pipe 30^1 owing to the position of the valve 32^1, so that if air is admitted through one of the pipes 12, it passes behind the diaphragm 14^1 and through the pipes 15, 16 to operate the primary pneumatic. If the positions of the valves 32, 32^1 are reversed, the other set of pipes is connected to the action. The apertures in the tracker connected to the pipes 11 are larger than the apertures connected to pipes 12, and the bleed-holes 18 are made correspondingly larger than the bleed-holes 19.

FIG. 2.



2385. Dickinson, J. H. Feb. 1.

FIG. II.

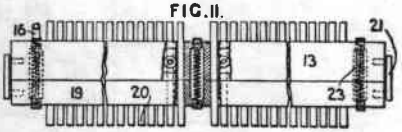
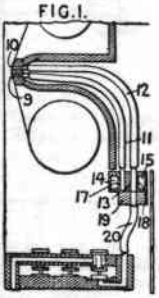


FIG. I.

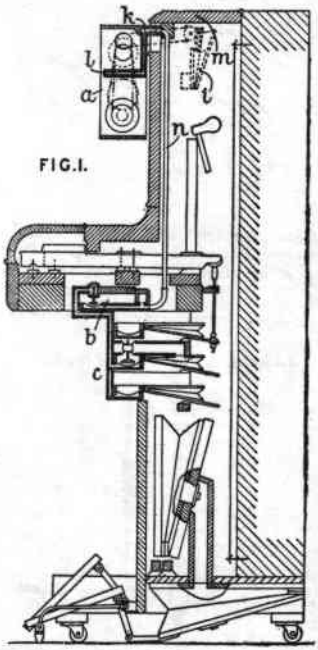


Tracker-bars.—In an automatic musical instrument, the tracker-bar is provided with two rows of ducts for tune-sheets of different compasses, and one or the other of these sets of ducts can be connected with the action by means of a valve which is mounted on pivoted links. The tracker-ducts 9, 10 are connected by tubes 11, 12 to a bar 13 having wind passages 14, 15 which are connected to exhaust through pipes 16, bleed-holes 17, 18 being provided for the tubes 11, 12. The bar 13, which is mounted on links 21 pivoted on the bar 19, is connected by tubes 20 with the action, and is attached to the bar 13 by springs 23. By shifting the bar 13 laterally, either of the sets of tracker-ducts can be connected to the action.

3172. Goldsmith, H. Feb. 9.

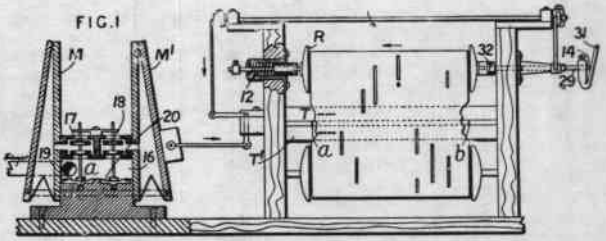
Player-pianos; winding-mechanism.—In means for playing an ordinary pianoforte by pneumatic apparatus, the tracker box l and music rolls a are attached to the block k, and have a detachable connexion with the block m inside the instrument. The block m is connected by the pipes n to the pneumatics b, c to operate the keys as shown. A winding-motor i is provided. The pneumatics may be engaged to pull down the keys.

FIG. I.



3310. Mackenzie, J. W., [*Autopiano Co.*]. Feb. 10.

FIG.1

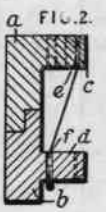


Tracker-bars; winding-mechanism.—In an automatic musical instrument, a device for automatically guiding the tune-sheet, such as that described in Specification 14,702/00, is used in conjunction with a tracker-bar having two series of ducts for tune-sheets of different compasses. Means are provided for manually adjusting the winding-roller, and also for ensuring the operation of the automatic device if the paper expands or contracts in width. The double tracker-bar T, T¹ is provided with ducts *a*, *b*, which are connected to chambers beneath the diaphragms 19, 20 for operating valves 17, 18. The apertures are normally covered by the tune-sheet, but if air is admitted to the duct *b* by movement of the tune-sheet to the left, the valve 18 is raised, shutting off the motor M¹ from the atmosphere and connecting it to the exhaust chamber 16. The motor M¹ thereupon collapses and through a system of linkage rotates a shaft 29, carrying a cam 31 which bears against one end of the spindle 14, thereby permitting the roller R to be moved to the right by the action of the spring 12, to return the tune-sheet to its normal position. If the tune-sheet moves to the right, it is returned to the normal position by the motor M in a similar manner. A handle 32 is provided on the shaft 29 for manually adjusting the roller R. In a modification, two sets of controlling-ducts at different distances apart are provided in the tracker, only one set being in operation at a given time. The inner ducts are connected to chambers above the primary valves, and the outer ducts are cross-connected to chambers below them. With this arrangement, the outer ducts can be used with a tune-sheet of normal width, the inner ducts being then operative with a contracted sheet; or the inner ducts may be operative with a tune-sheet of normal width, and the outer ducts with an expanded sheet.

3320. Hupfeld Akt.-Ges., L. July 22, 1908, [*Convention date*].

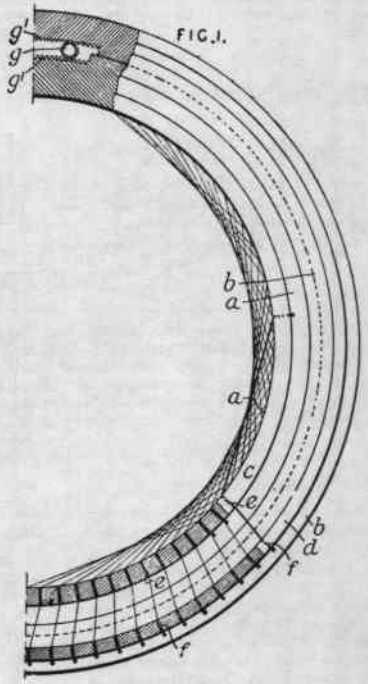
Stringed instruments.—In an annular bow for stringed musical instruments in which the hairs are arranged as chords of the body portion, means are provided for tensioning the hairs, either simultaneously or successively in groups. As shown in Figs. 1 and 2, the rings *a*, *b* are provided with ribs *c*, *d* having radial holes such as *e*, *f*, and one end of each hair is attached to a hole in the ring *a*, the other end being attached to a hole in the ring *b*; or both ends may be attached to the ring *b*.

FIG.2.



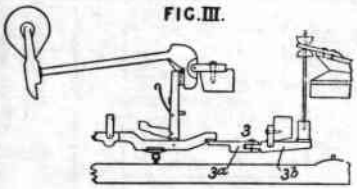
By means of racks g^1 and a pinion *g*, the rings may be rotated relatively to each other to adjust the tension of the hairs. The operating-device, which must be self-locking, may conveniently include a worm and worm-wheel. In a modification, the hairs pass through holes in adjustable screw clamps arranged round the periphery of the bow ring. These clamps may be used in combination with the rotating-ring arrangement previously described. In a further modification, one end of each hair is attached to a spiral or other spring mounted on the bow body.

FIG.1.



4163. Grainge, D., and **Kastner, M. M.** Feb. 19.

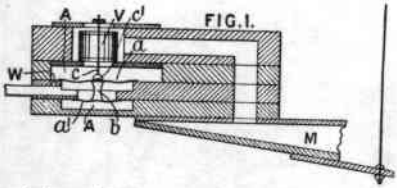
FIG. III.



Player-pianos. — Adjustably extensible levers 3 made in two parts 3^a, 3^b connected by a tongue and groove, are used to transmit the blows of the striking-pneumatics to the wippens of an automatic piano. A similar adjustment is applicable to the arrangement described in Specification 4804/09. According to the Provisional Specification, spring tongues may be fitted at the ends of the levers 3 to prevent shocks.

4532. Gittins, C. E. Feb. 24.

FIG. 1.

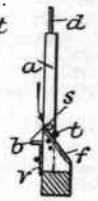


Actions.—In a pneumatic action for piano-players, which is adapted to be used in conjunction with a tune-sheet having apertures of varying areas for controlling the loudness of the notes produced, the valve V is operated by diaphragms a, a^1, or bellows, which are connected by a stem b. The diaphragm a, upon which the adjustable button c^1 of the valve-stem c rests, is of larger area than the diaphragm a^1, which retards the motion of the valve when it is operated to connect the note-operating pneumatic M to the exhaust box A. The space between the diaphragms is connected to exhaust by a bleed-hole W. In a modification, each diaphragm or bellows acts upon one end of a pivoted lever on which the valve stem rests.

4582. Rehbock, J. Feb. 25, 1908, [*Convention date*].

FIG. 8.

FIG. 3.

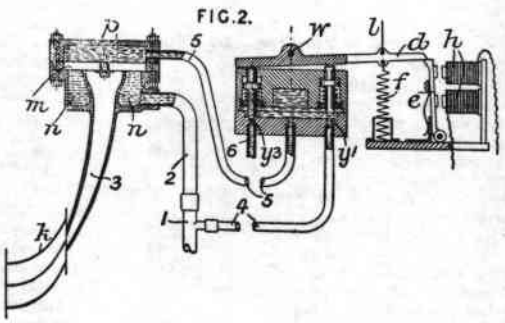


Stringed instruments; expression, controlling.—A plucking-device for stringed musical instruments, which may be used in conjunction with pneumatic operating-mechanism or the like, comprises a plucker a having a lateral projection b and a prolongation v, which is covered at the sides with felt and rests on the string. A pin s projects from the side of the plucker and rests on an inclined guide f, and a spring-pressed pin t, which is adapted to slide in guides o, also normally rests on the inclined guide f. When the sticker d is depressed, the string is plucked by the plucker b, which then moves away from the string, owing to the action of the pin s which slides down the guide f under the pin t. When the key rises, the pin s passes over the pin t, so preventing the plucker from touching the string. The Specification in the original form, as open to inspection under Section 91 (3) (a), comprises also means for varying the loudness of the notes produced by moving the pluckers towards or away from the springs by the operation of a pedal or press lever; this subject-matter does not appear in the Complete Specification as accepted.

4661. Lamprecht, M. Feb. 25.

Winding-mechanism.—An automatic musical instrument is driven by means of a water turbine which is adapted to be started by the completion of an electric circuit, for example by the insertion of a coin, and to be stopped by an aperture in the tune-sheet which controls a suitable bellows. When the circuit of the electro-magnet h is completed, the armature e is attracted, thereby releasing the lever d which moves about its pivot w under the action of the spring f to close the valve y^1 and permit the valve y^3 to open. The water, which is supplied through the pipes 1, 4, 5 to the chamber p, is thereby shut off, and this chamber is connected to exhaust through the pipes 5, 6. The

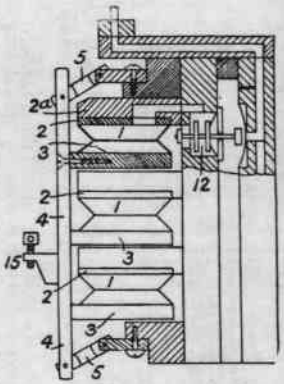
FIG. 2.



pressure in the chamber 2 thereupon raises the double-diaphragm valve *m*, and admits water through the pipe 3 to the turbine *k*. The diaphragm valve may be replaced by a piston. At the conclusion of the tune, the lever *d* is raised through the cord *l* by the operation of a bellows, and the parts return to the position shown.

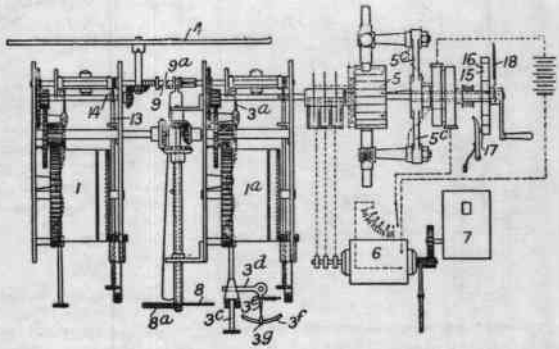
4804. Katz, C., and Kastner, M. M. Feb. 26.

Player-pianos; actions.—In a pneumatic action for automatic pianos, organs, piano-players, or the like, the pneumatics are of the type in which floating movable boards 3 are employed, so that as the pneumatic expands the board 3 remains parallel to the board 2. Each pneumatic is connected to a lifter 4 which is guided by radius rods 5 or by fixed guides, and the valve-board is provided with projecting shelves 2^a on which the pneumatics are mounted. The piano action is operated by an adjustable striker 15.

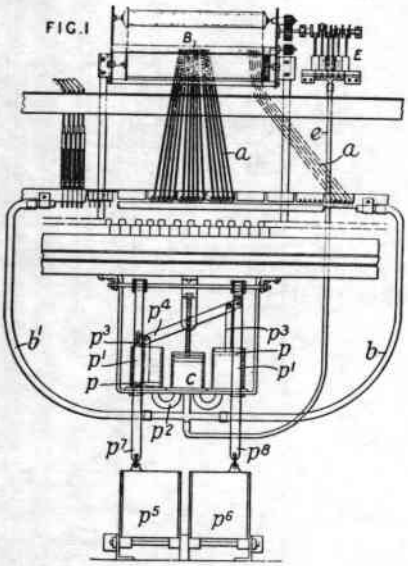


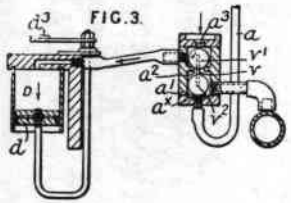
4899. Thormeyer, F. E. Feb. 27.

Winding-mechanism.—Relates to the synchronous driving of two apparatus, such as musical instruments driven by separate motors. The invention is described as applied to the synchronization of a phonograph and a kinetograph. A motor is provided with a speed-indicator common to it and the phonograph, and controls the driving of the kinematograph. A phonograph spring motor 1 driving a record turntable 4 is synchronized with a kinematograph 7 driven by an electric motor 6, by the aid of a spring motor 1^a detachably coupled with the phonograph spring motor and driving a distributing-gear 5 which supplies electric current to the polyphase synchronous motor 6. The spring motors 1, 1^a are connected respectively by bevel-gear with a disk 8 marked with lines and an index finger 8^a. When want of sychronism is indicated by the finger 8^a and the disk 8, the speed of the spring motor 1^a is altered by its brake lever 3^c controlling a brake 3^a and having a conical surface which moves a spring-controlled right angled lever 3^d and causes its pointer 3^e, which has moved away from a movable pointer 3^g on a graduated scale 3^f to return to its initial position. A more accurate readjustment of speed is then obtained by altering the brake lever 3^c until the finger 8^a and disk 8 are rotating uniformly. Elastic coupling-rods 9, 9^a on the spring motors 1, 1^a respectively are used to prevent the motors from getting more than one revolution out of synchronism. Stopping-levers 13, 14 are provided on both spring motors. Synchronism may also be obtained by rotating the brush bridge 5^c relatively to the distributing-commutator 5 through an angle indicated by division lines 16 on a disk 15 on the shaft of the bridge 5^c by the aid of a pointer 18. A spring-controlled finger 17 holds the disk 15 and the brush bridge in any desired position. The divisions 16 on the disk 15 correspond to the number of pictures which pass the kinematograph window for one revolution of the distributor 8. The spring motors 1, 1^a may be replaced by other motors, or other driving-means controlled by the distributor may be substituted for the electro-motor 6.



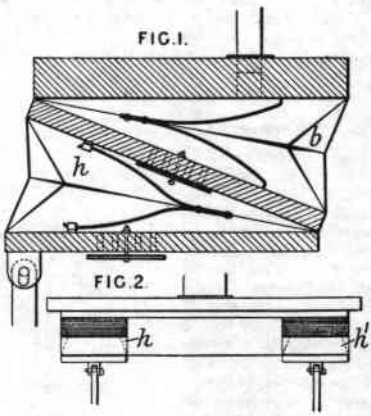
5812. Coldman, H. C., and **Webb, C. F.** March 10.





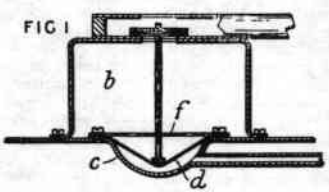
Player-pianos; actions; blowing and exhausting air; expression, controlling; treadle devices.—In an automatic piano, pistons and cylinders, arranged inside the piano casing, are substituted for the usual note-operating pneumatics. Pistons working in cylinders are substituted for the usual exhaust and equalizing bellows. Each piston d and cylinder D is controlled by a spherical valve v^1, which is mounted loosely on its stem and is operated through a ball v^2 and a rod v. When air is admitted from the tracker-bar B to the pipe a and the diaphragm a^x, the diaphragm rises, causing the valve v^1 to close the port a^2 and open the port a^3, so cutting off the atmosphere from the cylinder D and connecting it to the exhaust chamber a^1. The atmospheric pressure thereupon forces up the piston d, causing the part d^3 to operate the piano action. When the tune-sheet cuts off the atmosphere from the pipe a, the valves v^1 and the piston d fall by gravity to their normal positions. Springs which tend to force the pistons d downwardly may be provided, and silk, or other porous material, may be placed in the tubes a and above the ports a^3 to act as air-filters. The valves a^1 may be arranged to admit air under pressure to the cylinders D. The pumping-device comprises pistons p working in a cylinder p^1, which are connected by pipes p^2 to an equalizer C. The equalizer C is connected by pipes b^1, b to the action, and by a pipe e to the motor E. The piston-rods p^3 are connected by a bar p^4, which is operated by straps p^7, p^8 from treadles p^5, p^6. Pistons and cylinders may be used to control expression devices, but the equalizer is of such dimensions that the expression may be controlled by the treadle. According to the Provisional Specification, two valves of different areas are provided for controlling each piston and cylinder of the action.

5921. Atkinson, C. W. March 11.



Bellows, arrangement of; expression, controlling.—In the exhausting-apparatus for vacuum piano-players, the two bellows h, h^1 are mounted on the movable side of the reservoir b. This arrangement gives greater control of expression by the action of the feet.

6402. Atkinson, C. W. March 17.



Actions.—The purses or primary pneumatics c of a pneumatic action are formed by depressions in the floor of the vacuum chest b which is made of metal

or other depressible material. The diaphragm *d* is held down by a cover-plate *f*, which may be of sufficient length to serve for a number of purses.

6857. Hupfeld Akt.-Ges., L. Feb. 24, [*Convention date*].

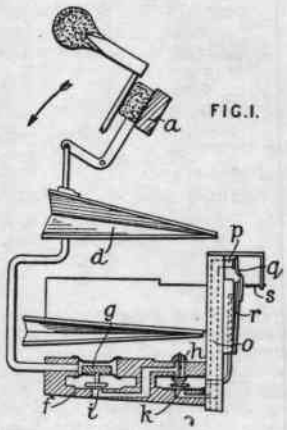


FIG. I.

Expression, controlling.—In an automatic musical instrument, the hammer rest-rail, which may be made in sections, is adapted to be shifted by one or more pneumatics *d*, in accordance with the variation of suction or pressure in the wind-chest. If the degree of suction is great, the pneumatic *r* collapses against the tension of the spring *s*, so that the valve *q* closes the aperture *p* of the duct *o* and the parts remain in the position shown, the hammer producing a fortissimo note when operated. If the suction is decreased, the spring *s* causes the valve *q* to open the aperture *p* to admit air beneath the diaphragm *k*, which raises the valve *h*, admitting air beneath the diaphragm *i*. The valve *g* is thereby raised, disconnecting the pneumatic *d* from the atmosphere and connecting it to the exhaust chamber *f*. The pneumatic *d* thereupon collapses, moving the rest-rail and hammer nearer the strings.

7949. Nyström, C. W April 2.

Players for keyboard instruments; actions; tune barrels, sheets, and the like.—In a player or music recorder for keyboard musical instruments of the type wherein wax-covered tune barrels or sheets are employed, two or more electro-magnets are provided for each note, which are energized in succession at time-intervals which vary according to the loudness of the note to be produced or recorded. The tune-sheet 8, which is provided with two grooves for each note, is wound from the roller 5 on to the roller 7, and passes in its course over a roller 6. As shown in Fig. 1, the roller 6 is in position for recording, and, on depressing a key such as 19, the spring 26 depresses a striker 20, and a loosely mounted contact disk 24, having a conical aperture through which the rod passes, in the first

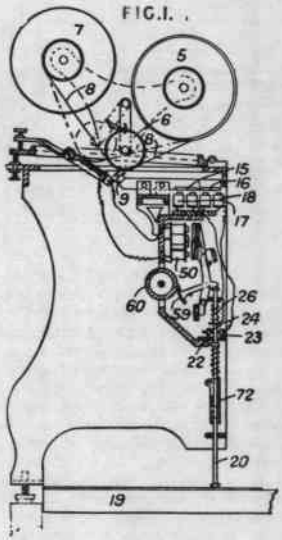


FIG. I.

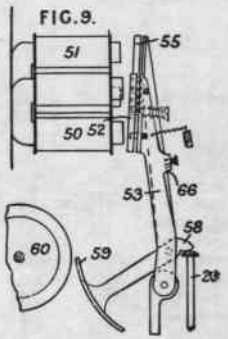
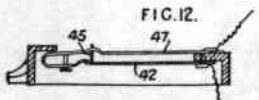
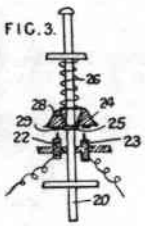


FIG. 9.

place completes the circuit of the electro-magnet 17 at the contact 22, and subsequently the circuit of the electro-magnet 18 at the contact 23. The electro-magnets 17, 18, attract their armatures 15, 16, successively at an interval determined by the rapidity of depression of the key, and the style 9 produce grooves on the tune-sheet 8, the relative lengths of which vary according to the rapidity with which the key is depressed. To reproduce the music played, the roller 6 is shifted to the position shown in dotted lines, and the tune-sheet is adjusted until the pins 45 of the contact devices are in alinement with the tune-sheet

depressions. When a pin 45 enters a depression, the adjustable armature 52 is attracted by an electro-magnet 50, Fig. 6, and an arm 66 of the link 53 draws the armature 55 towards its electro-magnet 51, so that the pivoted shoe 59 contacts with

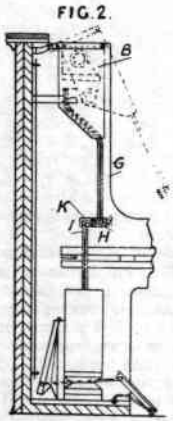




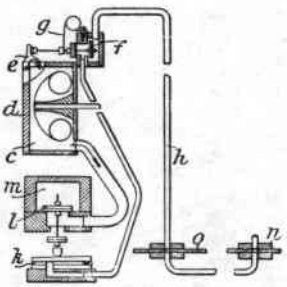
the rotating roller 60, causing the part 58 to depress the rod 20 and sound the corresponding note. After an interval which is determined by the relative positions of the tune-sheet depressions, and which determines the loudness of the note produced, the electro-magnet 51 is energized, causing the shoe 58 to be more forcibly pressed against the roller 60. The rod 20 comprises two parts united by a clamping-collar 72 so that its length may be adjusted, and in a modification this rod is made in two independent sections, each of which bears against a pivoted lever, for the purpose of increasing the movement of the contact disk 24. Alternatively, the striker may be pivoted on the shoe, being retained in position by a spring, or two independently operated strikers 58 may be provided for each note.

7951. Hupfeld Akt.-Ges., L., and **Hupfeld, L.** April 2.

Player-pianos; treadle devices, winding-mechanism.—In an upright player piano, the tracker-box B is fitted removably or pivotally in the upper part of the casing and serves as a support for the air-tube G, which leads to the front or movable part H of a junction box H, K, so that these parts can be removed in one piece or swung back into the top of the piano. The motor may be removable along with the tracker-box. Tubes I proceeding from the fixed part K of the junction-box are collected in bundles and passed through openings in the back of the key board.



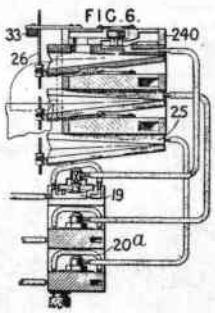
8284. Tye, A. J. W. April 6.



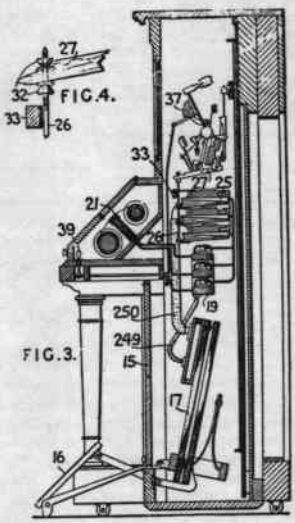
Players for keyboard instruments; wind and like instruments; tracker-bars; winding-mechanism.—In an automatically-operated pipe or reed instrument, or an automatic player, the door of a box containing the tracker-bar, controls a valve for admitting air under pressure to this box. This valve may also control the wind supply to the motor of the pallet-valves and the winding-motor. When the catch *e* of the door *d* is fastened, the valve *f* is opened against the action of the spring *g*, to admit wind from the pipe *h* to the pneumatic *e*. The latter expands, opening the valve *l* and connecting the box *c* to a chest *m*, which contains air under pressure. The door *d* may be provided with a glass panel. Slide valves *n*, *o*, controlling the pipe *h* are respectively connected to the "rewind" and on-and-off levers.

8569. Mackenzie, J. W., [*Simplex Piano Player Co.*]. April 8.

Pianofortes without keyboards; actions; treadle devices.—A pneumatic player piano without a keyboard has its parts arranged as shown in Fig. 3. The tracker 21, in a centrally-projecting portion of the casing, is in front of the striking-pneumatics 25, which are above the primary pneumatics 19. The construction of the primary pneumatics 19 with their bleeding-tubes 20*a*, and of the secondary



pneumatics 240 arranged on top of the striking pneumatics, is shown in Fig. 6. The wippens 27 are connected to the movable leaves of the striking-pneumatics by vertical rods 26, which pass up in

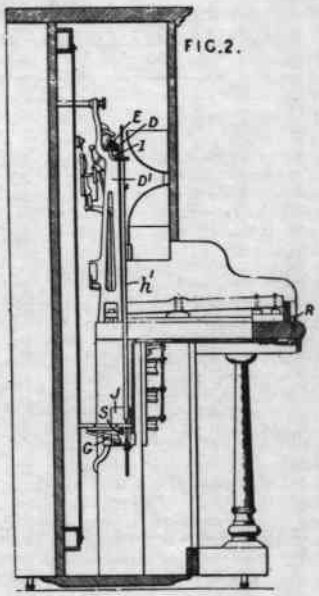


front of the actions. The front end of the wippens are slotted to engage the rods 26 between nuts 32, Fig. 4, so that, by removing a bar 33, the rods 26 may be swung out of engagement with the whippens. The rest rail 37 is actuated from a lever 39 in front of the tracker. The folding-treadles 16, for which a panel 15 is provided, actuate bellows 17, which are connected by separate passages 249, 250 to the primary and striking pneumatics.

6978. Atkinson, H. W. April 15.

Blowing and exhausting air; expression, controlling; tempo-regulating means.—Throttle-valves of automatic musical instruments are so mounted as to move at an angle to their seatings, so that the force required to operate them is minimized. As shown in Fig. 1, the valve *c* is mounted on pivoted links *d*, and contacts with its seating just before these links are normal thereto. Alternatively, the links *d* may move to the normal position, and a stop may be provided to prevent their moving beyond it. The valve may be opened or closed, either by means of an arm *h* attached to the link *d*, or by means of pivoted links *i*. In a modification, the valve slides on a fixed inclined guide, suitable antifriction devices being provided if necessary.

9329. Marks, H. C. L., [*Chase & Baker Co.*]. April 20.



Player-pianos; expression, controlling.—An automatic piano is provided with sectional rest-rails, which are operated by pneumatics arranged below the rest-rails and directly connected thereto. The main rest-rail D is pivoted to fixed supports D^1, and is operated by the pedal in the usual manner. The sectional rest-rails E are pivoted on brackets *f*, carried by the main rest-rail D, and are connected by arms I and rods h^1 to the pneumatics G. On depressing a push R, a valve is opened which admits air to another valve in the box J, causing the valve to open and connect a pneumatic G to exhaust. The pneumatic G collapses, thereby operating a sectional rest-rail, which, however, returns to its normal position on releasing the button R. The extent of the movement of the sectional rest-rails can be regulated by screws S.

Reference has been directed by the Comptroller to Specifications 16,587/04, 27,218/07, *and* 22,127/08.

9622. Atkinson, C. W. April 22.

FIG. 1.

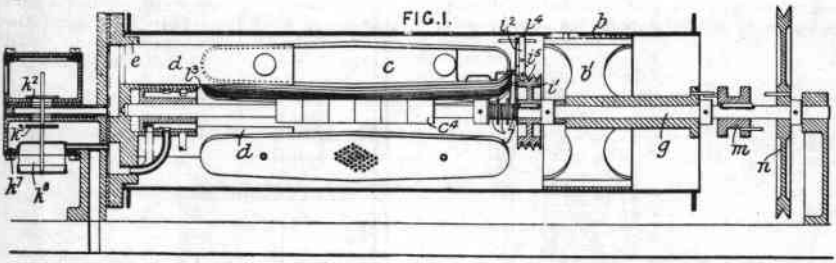


FIG. 7.

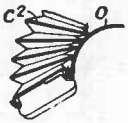
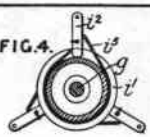


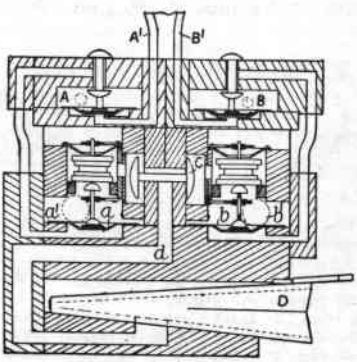
FIG. 4.



Music spools and rollers; winding-mechanism.—The pneumatic motor of an automatic musical instrument is arranged inside a winding-roll, which it drives through ratchet gearing. The bellows *c* are attached to tubular supports *d*, mounted on a support *e* which carries one end of a roller *b* and is provided with antifriction devices. The other end of the roller is mounted upon a skeleton support b^1 on the shaft *g*, and a clutching-device *m* is provided to clutch either the support b^1 or a sprocket-wheel *n* to the shaft. Each bellows *c* comprises a flexible envelope, provided with perforated stiffening-plate c^3 and a guiding-device *o*, which is arranged beneath these plates or passes through them, and the moving end-plate of each bellows is connected to two collars c^4, rotatably mounted on the shaft *g*. Springs *f*, preferably arranged round the shaft *g*, act between the back plate of one bellows and the front plate of the succeeding bellows in order to extend it. The bellows *c* are intermittently inflated and exhausted by the action of a rotary valve l^3 provided with ports, arranged in step fashion, which admit air to the pneumatics k^5, causing them to expand to open the valve k^3 and close the valve k^4. A bellows *c* is thereby connected to the exhaust chest k^7, and collapses. A grooved pulley i^1 is mounted on the shaft *g*, and around its periphery are arranged levers i^2, pivoted on arms i^4 carried by the moving end-plates of the bellows. Chains or cords i^5 attached to the lever i^3 encircle the pulley, which is either clutched and rotated or released according to the direction of movement of the arms i^4 carried by the bellows. Any other form of ratchet device may be employed.

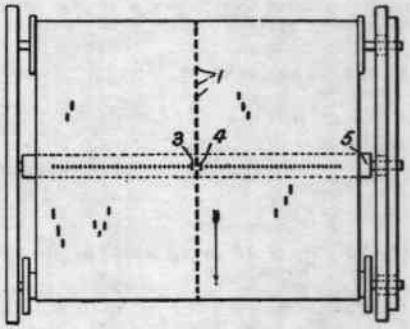
10,007. Murdoch, J. S., and **Bennett, J.** April 27.

Actions; expression, controlling.—In an automatic musical instrument of the type in which the note-operating pneumatic D may be connected either to the high tension suction-box b^1 or to the low-tension suction-box a^1, a valve C is provided which is automatically operated by air-pressure to connect the passage *d* either to the high or low tension suction-box. When a note of normal loudness is to be sounded, the tracker duct A^1 is opened, operating the primary and secondary valves A, *a*, in the usual manner so that the space to the left of the valve C is connected to exhaust, while the space to the right of it is connected to atmosphere. The valve C therefore moves to the position shown, completing the connexion between the suction-box a^1 and the pneumatic D. When a note is to be accentuated, the duct B^1 is opened and the valves B, *b*, C, are operated in a similar manner to connect the pneumatic D to the high-tension suction-box b^1.



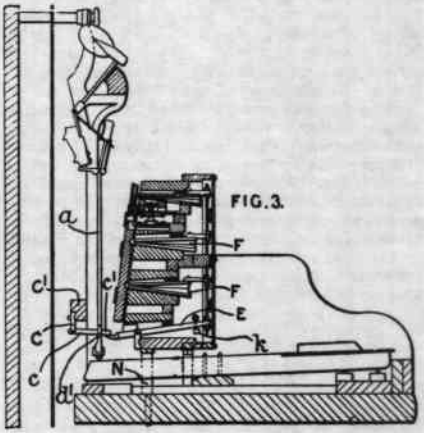
10,133. Walker, J. J. *July 18, 1908.*

Winding-mechanism.—In automatic musical instruments, means are provided for automatically adjusting the tune-sheet to ensure registration of the tune-sheet apertures with the tracker-ducts. The tune-sheet is provided centrally with a continuous row of perforations 1 which normally traverse the tracker-box 5 between the ducts 3, 4. When the tune-sheet moves towards one side or the other, the control perforations 1 register with one or other of the ports 3, 4, actuating a device, which may be similar to that described in Specification 27,043/05, for returning the tune-sheet to its normal position. The tracker-box and both winding-rollers may be arranged to be skewed simultaneously, as shown in the drawing, and the device may operate electrically.



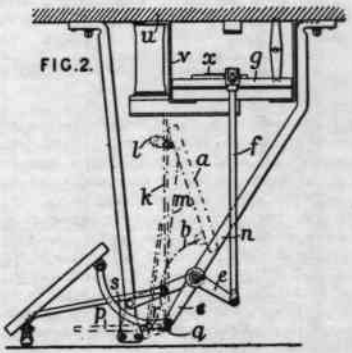
10,577. Marks, H. C. E., [*Chase & Baker Co.*]. May 4.

Player-pianos.—In an automatic piano, the action and wind-chest are removably mounted above and towards the rear of the keyboard, and the piano action is operated through pivoted levers E, *c*, when playing automatically. The levers *c*, which are pivotally mounted on brackets C attached to the supporting-rail C¹, pass through slots in the abstracts *a* to which they are pivoted at *d*¹. Extensions *c*¹ of these levers engage the levers E which are actuated by pneumatics F, controlled by valve mechanism which may be of the type described in Specification 17,849/06. Adjustable stops *k* are provided on the levers E. The wind-chest is provided with projecting lugs, which are adapted to be secured by means of screws to posts attached to the key table. Posts N are also provided upon which the wind-chest rests.



10,579. Stuart, H., and **Broadwood & Sons, J.** May 4.

Player-pianos; blowing and exhausting air; treadle devices.—In an automatic horizontal piano, the treadles *a*, which are adapted to be folded up, are pivoted on a bar *l* and are connected by links *b* to the arms *c* of bell-crank levers, the other arms *e* of which are connected by links *f* to the bellows. The bar *l* is connected by pivoted links *m* to a framework *n*, and the arms *c* are so arranged that the initial pressure of the feet upon the treadles is approximately normal to these arms. The treadles may be folded up into the position shown in dotted lines, a vertical bar *k* which engages the bar *l* being provided to limit their movement. The "expression" pedals *p*, for use in playing the instrument manually, are pivoted on a spindle *q*, carried by a bracket *r* which is mounted on rods *s*. The bellows *g* are arranged below the key-bed, preferably at such a distance that the upper boards



can be oscillated. The valves x comprise metal strips resting on felt.

11,426. Taylor, G. H. May 14. *Drawings to Specification.*

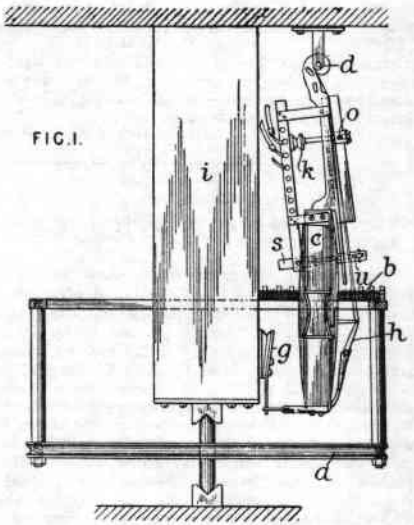
Music spools and rollers.—The tune-sheet rollers are provided with detachable and reversible flanges having extensions which fit into holes in the ends of the rollers. Springs carried by the flanges fit into grooves in the rollers in order to hold the flanges in position.

Reference has been directed by the Comptroller to Specification 13,674/04.

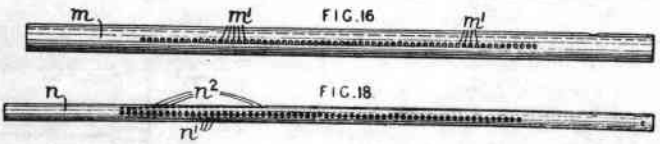
12,573. Hupfeld Akt.-Ges., L. June 1, 1908, [*Convention date*].

Stringed instruments; expression, controlling.—A stringed musical instrument, which may be played automatically or from a keyboard, comprises a number of violin-like instruments c, which are provided with resonators, arranged on pivots d and connected to pneumatics g carried by a box i, which is arranged within the annular bow b. When the pneumatic g collapses, the string or strings h are caused to move into contact with the bow b. Bellows k are adapted to actuate fingers o for stopping the strings. When the instruments are provided with several differently-tuned strings, each instrument is pivoted on a universal joint and is acted upon by two or more pneumatics, one of which is adapted to move it laterally and the others to rotate it about a longitudinal axis. To produce a pizzicato effect, a pneumatic s actuates a pivoted plucker u, which moves to an inoperative position on the return stroke. An intermittently-operated pneumatic, which is connected to the strings, is adapted to produce a tremolo effect.

FIG. 1.



12,866. Hornbeck, H. S., and **Newcomer, G. M.** June 1.



Player-pianos; expression, controlling.—In an automatic piano, the main rest-rail f carries pneumatics g^1, which are adapted to operate sectional rest-rails g, and are controlled by means of a slide valve, the position of which may be varied by shifting the lever l. An indicator is provided to show which of the sectional rails is in the position for accentuation. On moving the lever l to the right, the motion is transmitted through the link l^1, bell-crank l^4, and link l^3 to a slide valve k. As the valve moves, a port h^2, Fig. 6, is uncovered, admitting air through a pipe h^3 to a valve f^7, which, in rising, connects the pneumatic f^6 to the wind-chest d^1 and causes it to collapse. The pneumatic f^6 is connected by a link f^5 to the main rest-rail f, so that this moves about its pivots f^3, causing all the piano hammers to be shifted towards the strings. As the motion of the valve f^7 continues, the ports h^1 are successively connected to the exhaust-chest d^1, causing the pneumatics such as g^1 to be successively exhausted, and the throw of the corresponding hammers to be increased. At the same time, a rack attached to the valve and gearing with a pinion o^1 on a shaft o, actuates a device for indicating which pneumatic g^1 is deflated. This device, which is shown in Figs. 16 and 18, comprises a

spindle n, marked with a line of dots n^1 arranged in a straight line and dots n^2 arranged spirally, and this spindle is adapted to rotate in a tube m having apertures m^1. As the spindle rotates, the dots n^2 are visible through the apertures m^1 and indicate the position of the notes which will be accentuated. In a modification, means are also provided for indicating whether the sectional rest-rails are in

FIG. 1.

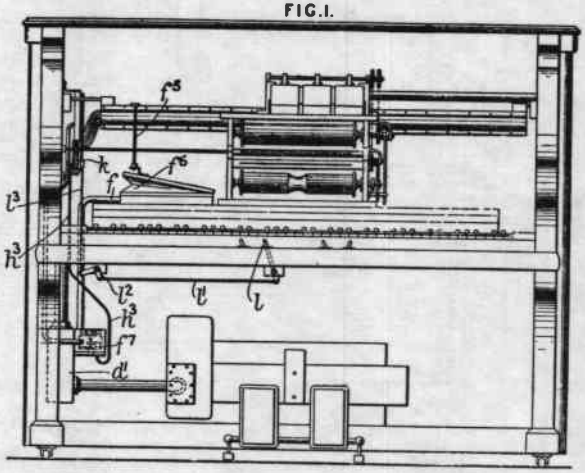
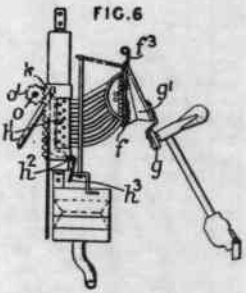


FIG. 6

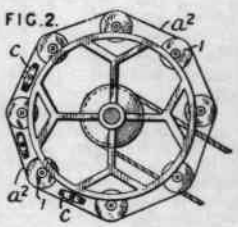


position for *solo*, or *piano* playing throughout the scale, and the lever l, when pulled sideways, operates a valve controlling the connexion between the slide valve and the wind-chest. By depressing the lever l, a port is opened to operate a valve which controls the inflation or deflation of the pneumatic f^6. A cranked rod, operated from the lever l, is substituted for the indicator shown in Figs. 16 and 18.

12,916. Hupfeld Akt.-Ges., L. June 1. [*Addition to* 12,573/09.]

Stringed instruments.—Relates to improvements in mechanically-operated stringed instruments of the kind described in the parent Specification, according to which a number of violins are arranged inside an annular bow. In one modification of the present invention, the violins are arranged outside an annular bow instead of inside it, the bow being provided with hairing on its periphery. Alternatively, as shown in Fig. 2, a band bow a^2 passing over pulleys 1, which are driven from a central wheel, may be used, the violins c being arranged in an upright or inclined position, either inside or outside the band. In a further modification, circularly-arranged bowing-disks driven by a common driving-mechanism are employed, each of which is adapted to bow one violin.

FIG. 2.

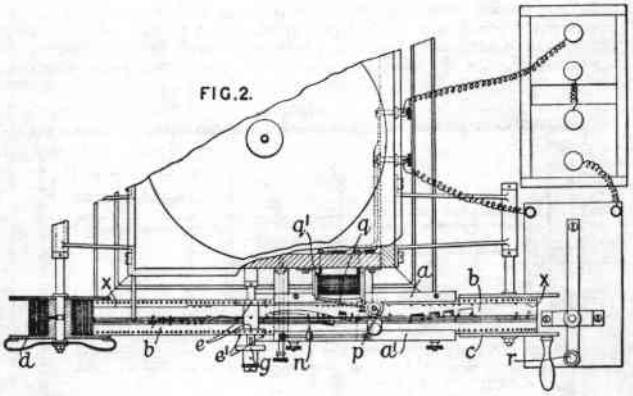


13,235. Pezzer, M. de. June 5.

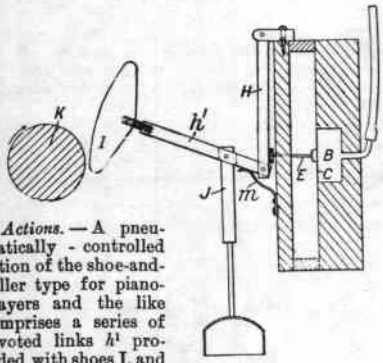
Combined with phonographs; tune-sheets.—An automatic piano or organ is employed for accompanying a piece performed by a phonograph, the winding-mechanism of the piano or organ being mechanically connected with the driving-mechanism of the phonograph so that the two rotate in

synchronism. In the preparation of the tune-sheet, a pin-wheel e, which is driven from the turn-table spindle of the phonograph, causes a band b to traverse a platform a provided with guides a^1. The band is wound from the reel c on to the reel d. A style p, attached to the armature q of an electro-magnet q^1, rests upon the band b and is controlled by a switch r. The switch r is depressed during the sounding of each note in a song, causing a break in the continuity of the line X which is traced on the band. The band b is subsequently employed for determining the relative positions of the tune-sheet apertures.

FIG. 2.



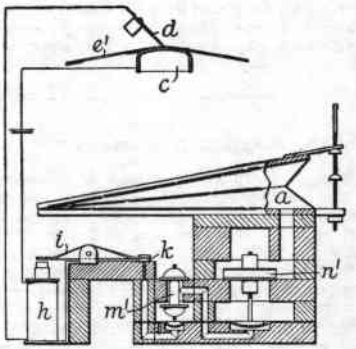
14,057. Mason, A. June 15.



Actions.—A pneumatically-controlled action of the shoe-and-roller type for piano-players and the like comprises a series of pivoted links h^1 provided with shoes I, and normally supported by springs m. When air is admitted from the tracker-bar to a chamber B, a diaphragm C is pushed inwards, and the motion is transmitted by a pusher E and links H, h^1, causing a shoe I to contact with the rotating roller K and a plunger J to strike a key. The parts are returned to their normal positions by the spring m.

16,007. Trist, A. B., and Trist Piano Player. July 8.

Actions; tracker-bars.—The note-operating pneumatics of a piano-playing mechanism are controlled by three valves, one of which is operated electro-magnetically while the others are operated by pneumatic means. When a tune-sheet aperture e^1 passes over the tracker-bar c, a contact finger d completes the circuit of an electro-magnet h,



which attracts its armature i and opens the primary valve k. Air is thus admitted to the purse of the secondary valve m^1, which thereupon rises and connects the purse of the tertiary valve n^1 to atmosphere, causing it to rise and connect the pneumatic a to exhaust, while cutting off its connexion to atmosphere. The pneumatic a thereupon collapses, causing a note to be sounded.

16,941. Thormeyer, F. E. July 20. *No Patent granted (Sealing fee not paid).*

Winding-mechanism. — Relates to means for synchronizing two pieces apparatus, such as two musical instruments, and consists in providing a separate motor for each apparatus with separate regulating-means, and a detachable coupling between the two apparatus; a speed-indicator is also used. The application of the invention to the synchronizing of a phonograph and a kinematograph is described. The motors 1^a, 1^b mounted in a frame 1 respectively drive the kinematograph 18 and the gramophone turntable 22. Separate winding-means 5, 6 and separate brakes 33, 33^a are provided. A speed-indicator disk 29, which is mounted on a hollow shaft 28, is rotated by the motor 1^b, and an indicator finger 29^a is rotated by the motor 1^a. A sliding coupling 23, 23^a between the two motors is operated by a pivoted handle 24. On the brake handle 33^a is a cone 34, which operates a bell-crank lever 35 having a pointer 35^a. This pointer is set by means of the brake lever 33^a at a point predetermined by the position of a movable pointer 37 on a previously calibrated scale 36. In the form shown in Fig. 2, the detachable coupling-means is combined with the indicating-means. A motor 64, which drives the gramophone turntable 65, is connected by a shaft 63 and a bevel-gear 66 with a bevel-gear 67 integral with an indicating-disk 69. This disk is provided with pins 70, and the gear 67 and disk 69 are loose on a shaft 68. A pointer 72 operated by a lever 73 and carried by a sleeve 71 rotates with and slides on the shaft 68. The electric motor 74 of the kinematograph 73^1 drives the shaft 68 and with it the pointer 72 through shafts 80, 79 and bevel-gears 77, 76. The speed of the motor is adjusted by varying the resistance 75. When the gramophone 65 and kinematograph 73^1 are running in synchronism, the two instruments are mechanically coupled by the sliding pointer 72 and the pin disk 69.

FIG. 1.

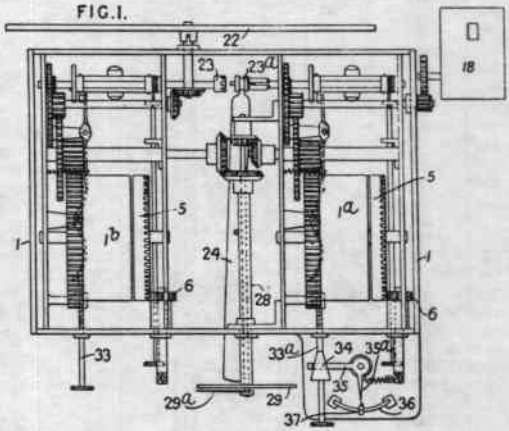
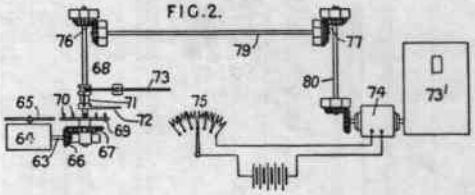


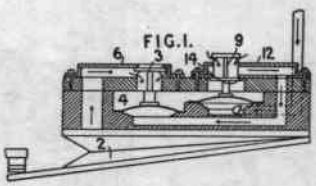
FIG. 2.



17,276. McHardy, E. H., and **Klingmann, E.** July 24.

Actions. — The ducts connecting the note-operating pneumatic 2 to the exhaust-chest 4 is formed by means of a cap 6, which is readily removable in order to facilitate the cleaning or replacement of the secondary valve 3. A similar cap 12 is provided for the primary valve 9, a plate 14 being interposed between the cap and the wall of the exhaust-chest.

FIG. 1.

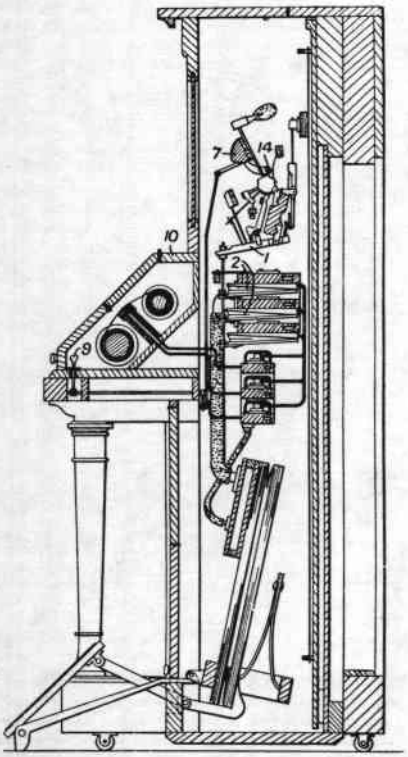


18,865. Mackenzie, J. W., [*Simplex Piano Player Co.*]. *April 8.*

Pianofortes without keyboards; actions; expression, controlling; treadle devices.—In a pneumatic piano without a keyboard, the pianissimo effect is improved by positively connecting the wippens 1 to the striking-pneumatics 2, so that the rest-rail 7 partly collapses all the pneumatics at the same time that it shortens the stroke of the hammers. The rest-rail is pivoted at 14 and is actuated from a lever 9 in front of the projecting tracker-box 10.

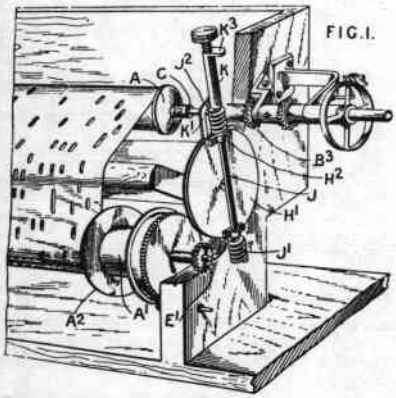
(*For Figure see next page.*)

18,865.



18,924. Young, A. T. Aug. 17. [*Addition to* 19,060/08.]

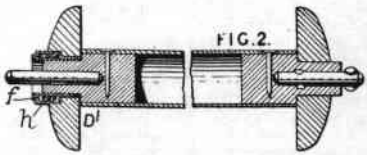
FIG. 1.



Transposing-means; winding-mechanism.—For effecting transposition, the two music spools are shifted axially by rotating a shaft J, after first rocking it to engage worms J^1, J^2 with worm-wheels E^1, B^3. The worm-wheels E^1, B^3, which form part of the normally-running gear, shift, respectively, the adjustable flanged sleeve A^2 on the take-up spool A^1, and the bearing-spindle C of the delivery spool A, by means of screw-mechanism described in the parent Specification. The shaft J is mounted in bearings H^2 on a pivoted disk H^1, and is held in operative or non-operative position by a spring-pressed sleeve K having a lifting-lug K^3 and a detent K^1 engaging in notches. The worm-gearing J^1, J^2 may be replaced by bevel-gearing.

19,296. Bayer, W. F. Aug. 21, 1908. [*Convention date*].

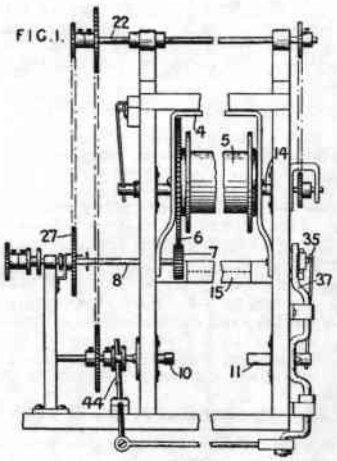
FIG. 2.



Music spools.—To allow for slight variation in the width of a music sheet, the end flange D^1 of the spool is pressed against the sheet by means of a spiral spring *h* which rests against the cap *f*.

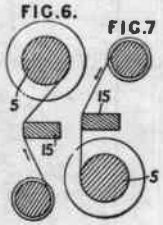
19,549. Fairweather, W., [*Wilcox & White Co.*]. Aug. 25.

FIG. 1.



Winding-mechanism is arranged to accommodate music spools having the expression marks on either face of the rolled sheet, and to expose the marked face to the operator. The take-up

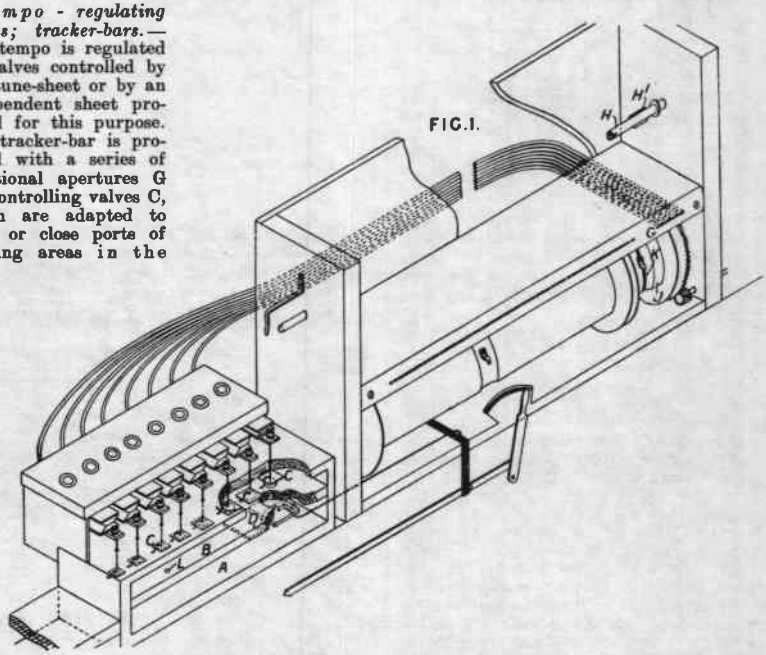
spool 5 is on a pivoted frame 4, Fig. 1, which can be swung into either of two positions on opposite sides of the tracker 15 to co-operate with the delivery spool, which is mounted either on the socket 10 or on socket 14. The music is wound upwards or downwards as shown in Figs. 6 and 7,



according as it is marked on the inside or outside of the roll. The drive in both cases is from the shaft 8 through gears 6, 7, and re-winding is effected by shifting the shaft 8 to the left to disengage the gears 6, 7 and to clutch in a sprocket-wheel 27 which drives the shaft 22 and thereby the sockets 10, 14. The frame 4 is retained in its extreme positions by stops and spring-studs. To give the frame clearance room when it is swung down into its lower position, a cam on the bearing-pin 35 is arranged to rock cranked shafts 37, 44, which retract the bearings 10, 11.

19,813. Raison, H. Aug. 30.

Tempo - regulating means; tracker-bars.—The tempo is regulated by valves controlled by the tune-sheet or by an independent sheet provided for this purpose. The tracker-bar is provided with a series of additional apertures G for controlling valves C, which are adapted to open or close ports of varying areas in the

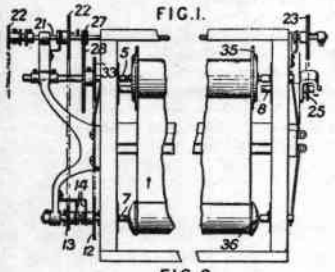


partition between the wind-box A, which is connected to the main wind-chest, and the "tempo-"box" B, which is connected to the motor. The wind-box is connected to the "tempo-box" by a small aperture L, the large aperture D in the partition between them being normally closed by a hand-operated valve. The spindle H, which is adapted to receive the delivery roller, is provided with keys H^1 which enter keyways in a small spool carrying an auxiliary sheet, one end of which is attached to a hook mounted on a movable band K on the spool J. In operation, these auxiliary spools rotate synchronously with the usual delivery and take-up rollers, and one or more of the valves C are operated according to the number of apertures in the auxiliary sheet. The auxiliary sheet and delivery and take-up rollers may be dispensed with, the tune-sheet being provided with special apertures for controlling the valves C.

19,843. Fairweather, W., [*Wilcox & White Co.*]. Aug. 30.

Winding-mechanism; music spools.—Rolls having the expression marks on either the inside or outside of the rolled sheet may be used, the marked faces being exposed to the operator during winding in both cases. The winding in the two cases is in opposite directions across the

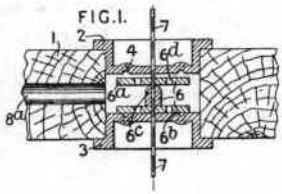
tracker. The apparatus comprises three driving-sockets 5, 7, 8, Fig. 1, and spools 35, 36 which can be mounted in different positions thereon. Music marked on the inside is wound upwards,



as shown in Fig. 1, from the spool 36 to the spool 35, the latter spool being driven through the socket 5 and gears 28, 27 from the main driving-shaft 21. A rapid rewind is obtained by shifting the shaft 21 to the left, which disconnects the gears 27, 28 and clutches in the sprocket 22 which drives the socket 7 through the sprocket 13. For music marked on the outside, the take-up spool 35 is mounted on the socket 7, and the delivery spool is mounted on the socket 8. The spool 35 has an extended axle, which operates clutch mechanism to disconnect the socket 7 from the sprocket 13, and to connect it to sprocket 12. Winding therefore takes place through the gears 27, 28, 33, and 12. A rapid rewind is obtained by shifting the driving-shaft 21 to the left, which cuts out the gear 28 and clutches in the sprocket 23, which drives the sprocket 25 on the socket 8. The clutch-gear for driving the socket 7 at slow speed when it carries the take-up spool 35 is shown in Fig. 6. When the extended axle of the spool is inserted in the socket 7, it pushes back an internal shaft 15 carrying pins 16, 17 which project through slots in the socket. The shaft and socket are thereby disengaged from the sprocket 13, and connected to the sprocket 12. Tongues 14 prevent lateral shifting of the sprockets 12, 13.

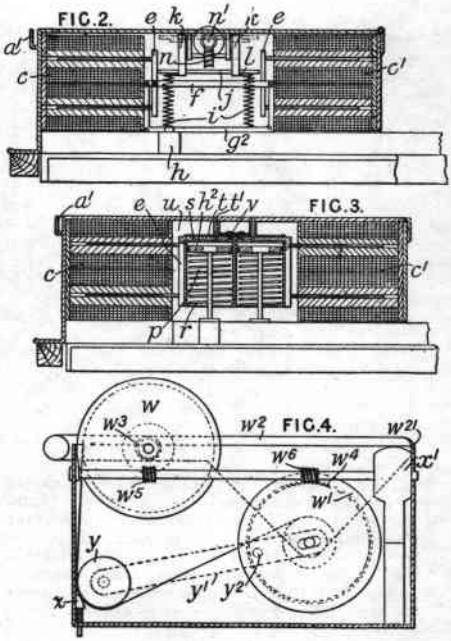
20,135. Genzel, F. Sept. 2. *No Patent granted (Sealing fee not paid).*

Actions.—A pneumatic relay is controlled by valves 6^a, 6^b disposed between adjustable ported caps 2, 3 which may screw into the board 1. The valve-member 6^a is loosely mounted on the lifter 7, and the valve-member 6^b is fast thereon and has a button 6^c glued to it. The duct 8^a leading to the power pneumatic may be normally connected either to the atmosphere or to exhaust. In the former case, when air is admitted to a diaphragm connected to the lifter 7, the valves 6^a, 6^b are lifted, closing one



annular port 4 and opening the other, thereby cutting off the connexion of the duct 8^a to atmosphere and connecting it to exhaust, so causing the power pneumatic to collapse. The apparatus may be arranged to work by pressure instead of by suction.

21,494. Cornford, W. A. Sept. 21.

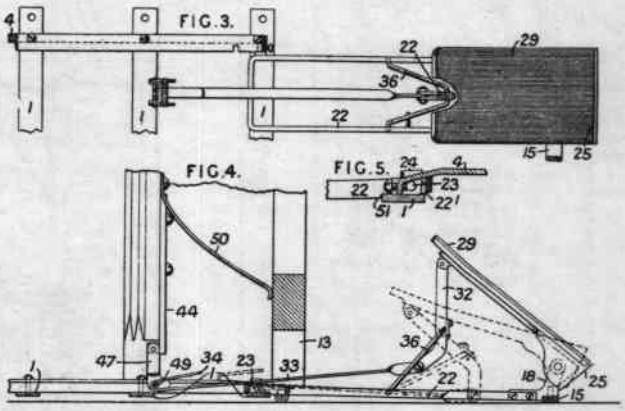


Piano-players; actions; expression, controlling; tracker-bars; winding-mechanism.—The playing-mechanism is mounted in a casing adapted to be hinged to the pianoforte in place of the usual key-cover. The expression is controlled by means of springs of variable tension

which act upon the strikers. The winding-mechanism is contained in a case which is placed above the key-cover. In Fig. 2, which illustrates an electric action, the electro-magnets are arranged in two rows c, c^1 and act upon armatures e which are connected by links f to bell-crank levers, upon the arms g^2 of which the strikers h are mounted. The strikers h are connected by springs i to a plate j which is mounted on pins l carried by the disks k. By rotating these disks through a worm n^1 and worm-wheel n, the tension of the springs i is adjusted. Fig. 3 shows an electro-pneumatic action. When an electro-magnet c or c^1 is energized, the attraction of its armature e causes a slide valve s to connect a cylinder p to a wind-chest u through the ports t. The piston h^3 is then forced down against the action of the spring r, causing a note to be sounded. The valve s is returned to its normal position by the action of a spring v, and the port t^1 then connects the cylinder p to atmosphere. The expression is controlled by varying the pressure in the wind-chest u. The winding-mechanism and contact-device, which are shown in Fig. 4, are adapted to be placed above the key-cover, the contact-fingers z entering sockets a^1 which are in electrical connexion with the electro-magnets c, c^1. The winding-rolls w, w^1 are mounted in a frame w^2, which is pivoted at w^{21}, and are adapted to be driven from an electric motor x^1 through worms w^2, w^6 and worm-wheels w^3, w^4. To rewind the tune-sheet, the frame w^2 is depressed to disengage the worm-wheel w^4 from the worm w^5 and to cause the worm-wheel w^3 to gear with the worm w^7. At the same time the roller y, which is carried by a lever y^1 pivoted at y^2, is raised, so breaking the circuits of all the electro-magnets.

21,831. Gulbransen, A. G. Sept. 24.

Player-pianos; treadle devices. — The treadles are mounted on a sliding frame which may be pushed within the piano-casing. When the treadles are in the operative position, the sliding frame is locked, and when the treadles are pushed within the piano-casing, the connecting-rod is automatically disconnected from the bellows. The treadles 29 are pivoted in brackets 18 attached to U-shaped frames 22, a transverse bar 15 connecting the brackets 18 together. The frames 22 are provided with locking-shoulders 51, projections 24, and pins 23 which slide in guides 4, fixed to bars 1 which are attached to the instrument. The upper ends of the treadles 29 are connected by pivot links 32, 33, pins 49, and pivoted links 47, to bars 44 which are attached to the moving boards of the bellows. A swinging link 36 connects the link 32 to the frame 22, and the bellows are normally maintained closed by springs 50 which bear against the instrument casing. When the treadles are depressed, the parts move to the positions shown in dotted lines in Fig. 4, causing the bellows to be operated. To place the treadles within the instrument casing, the bar 15 is raised, so that the frames 22 pivot about their bevelled edges 22^1 until the shoulders 51 on the frames 22 discharge the bar 1, and the frames are slid rearwards until the hooks 34 disengage from the pins 49. The treadles fall, and may then be pushed through apertures 13, provided in the casing, which are adapted to be closed by the flanges 25 of the treadles.

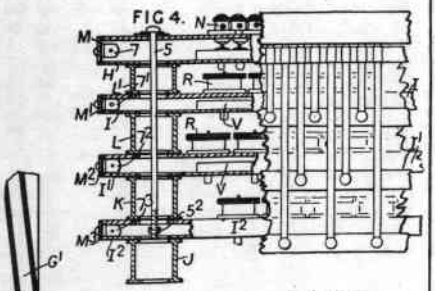


21,946. Higel, O., and **Heintzman, G. C.** Sept. 25.

Actions.—A pneumatic action is provided with metal valve casings which are cast in one piece. The secondary valve casings R, Fig. 3, are provided with curved tubes having flanges, to which the note-operating pneumatics are attached. The wind-chests H, I are formed of metal and contain bars Q, V of fibrous material to which the

valve-operating diaphragms Q^1, V^1 are secured. The tracker ducts are connected by rubber tubes G^1, Q^6 and nipples to the primary valves. Each duct is connected through a " bleed hole " provided in a diaphragm F to a channel C^1, which is

FIG 4.



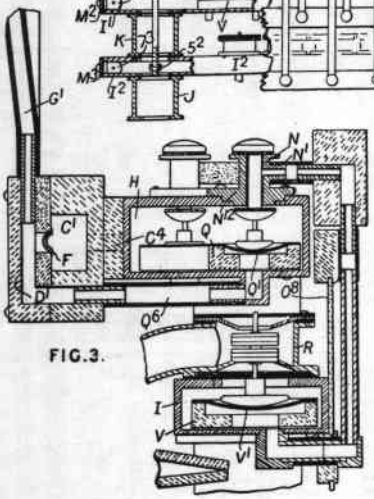


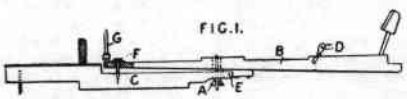
FIG.3.

connected by a passage C^4 to the wind-chest H of the primary valves. The cover D^1 is removable so that the passages are readily accessible for cleaning. The primary valve casings N are arranged in staggered rows in a single tier, and the secondary valve casings R and the note-operating pneumatics are arranged in three tiers. The primary valve casings are provided with flanges N^{12}, which fit into grooves in the wind-chest H, and also with nipples N^1 which are connected by rubber and metal tubes and wooden ducts to the secondary valves. As shown in Fig. 4, all the wind-chests H, I, I^1, I^2 are connected by flanged pipes L^1, L, K, J and are held together by a rod 5, which screws into a cross-bar 5^2 in the chamber I^2. The ends of the vacuum chambers are closed by plates M, M^1, M^2, M^3, which are secured to brackets 7, 7^1, 7^2, 7^3. Celluloid plates O^6 enclose most of the parts.

22,300. Hosley, M. D. April 19, [*Convention date*].

Player-pianos. — The keys of a mechanical grand piano are made in two parts C, B, pivoted together at the rear end E of the lower part and capable of relative motion through a small angle limited by a screw F. In manual playing, the whole key tilts on the balance-rail A; in mechanical playing, the strikers G tilt the

FIG.1.



rear portion B on the pivot E, the front portion C remaining motionless. Both operations impart the same movement to the hammer mechanism through the pin D.

22,835. Streich, R. Oct. 6.

FIG.1.

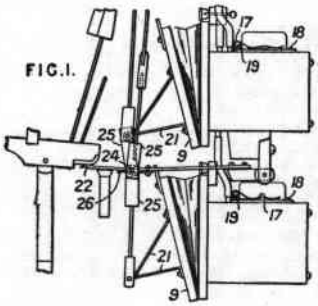
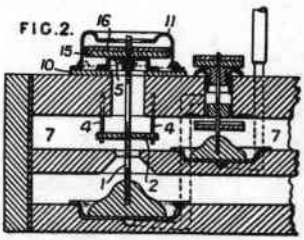


FIG.2.

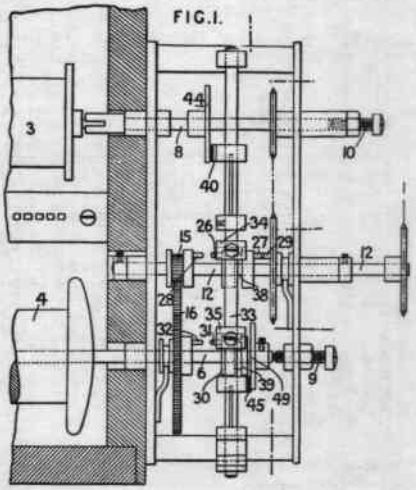


Player-pianos; actions.—The secondary valve stem 1 is provided with projecting arms 2, provided with a slot and a hole respectively, which are engaged by guide-pins 4. A dished valve 5, made of hard material, is adapted to open or close the passage leading from the wind-chest 7 to the note-operating pneumatic 9, and valve members 15, 16, of soft material, serve to open and close the connexion to atmosphere. A seating 10 of soft material is provided on the wind-chest for the valve 5. The valves are enclosed in a casing 11, preferably of rectangular form, which is held in position by spring catches 17, and screws 19 or pins 18. The connexion between each note-operating pneumatic and the piano action comprises a metal loop 21, on the moving board of the pneumatic 9, and a link 25 connected to a pivoted lever 22 for operating

the piano action. The link 25 is provided with a pin 24 engaging a recess in the lever 22 and retained in position by a spring 26. In a modification for a grand piano, the striker is detachably attached to a loop, such as 21, by similar means. Specification 11,377/10 is referred to.

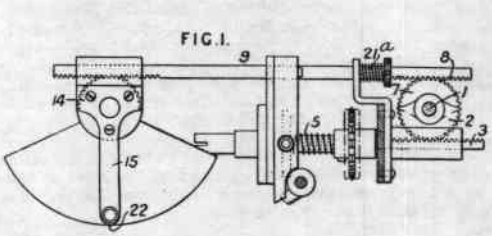
23,079. Riley, W. J., [*trading as* Yote Manufacturing Co.]. Oct. 9.

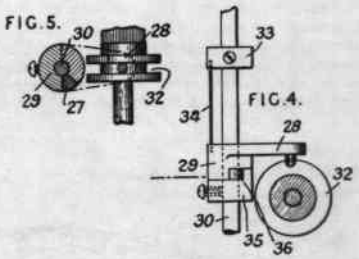
Winding-mechanism.—The pinion 15, which is loose on the driving-shaft 12, is always in mesh with the loosely-mounted spur-wheel 16 driving the shaft 6 of the take-up roller 4. The vertical spindle 33 is provided with arms 34, 35, which engage clutch-members 38, 39, sliding on keys attached to the shafts 12, 6, respectively. Before playing a tune the shaft 33 is rotated, causing the clutch-members 38, 39 to move to the left, so that the pins 26, 31 engage the pins 28, 32, respectively, clutching the pinion 15 and spur-wheel 16, to their shafts. At the same time, a brake 40 of the kind described in Specification 23,209/08, is applied to a disk 44 mounted on the shaft 8 of the music roll. To rewind the tune sheet, the spindle 33 is rotated in the opposite direction, de-clutching the spur-wheels 15, 16, and causing a pin 27, on the clutch-member 38, to engage a pin 29 carried by the sprocket-wheel which is loosely mounted on the shaft 12, so that the music roll 3 is driven at high speed. Simultaneously, a brake 45 is applied to a disk 49 on the shaft of the take-up roll. Alternatively, the pinion 15 may be keyed to its shaft, and one of the clutch-devices may then be dispensed with. The shaft 8 of the music-roll may be driven by spur-wheels which are always in mesh, instead of by a chain and



sprocket-wheels. Screws 9, 10, bearing against the ends of the spindles, are provided for the lateral adjustment of the tune-sheet.

23,080. Riley, W. J., [*trading as* Yote Manufacturing Co.]. Oct. 9. [*Addition to* 23,209/08.]

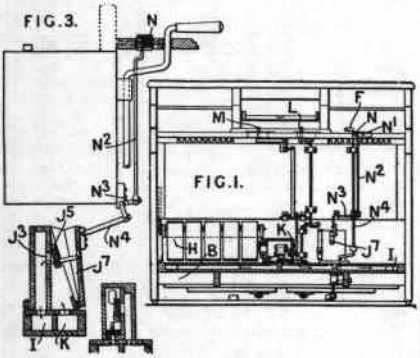




Transposing-means; winding-mechanism.—Relates to improvements on the means described in the parent Specification, for adjusting the winding-rolls laterally, and for engaging and disengaging the pinion on the driving-shaft from the spur-wheel on the take-up roll spindle of an automatic musical instrument. The handle 15 for adjusting the rolls is provided with a pointer 22, which moves over a scale, and a toothed sector 14, which engages with teeth provided on a sliding member 9. This is also provided with teeth 8 which engage with a toothed sector 7, mounted on a vertical spindle 1, which carries other toothed sectors such as 2, engaging teeth on the sliding pins 3 for effecting the lateral adjustment of the rolls. A spring 21a is provided to counteract the effect of the spring 5, and a spring of adjustable tension is provided on the pivot of the handle 15. For shifting the pinion on the driving-shaft, the vertical spindle 30 is provided with a loosely mounted arm 28 which is connected by a spring 34 to a fixed collar 33, and engages a collar 32 on the shaft carrying the pinion, so that the spring tends to push the pinion into gear. A fixed collar 35 on the spindle is provided with a pin 36 engaging, with lateral play, a notch 27 in the collar 29, so that, when the spindle is

rotated in one direction, the pinion is taken into mesh by the action of the spring 34. When the pinion is taken out of mesh, it is clutched to a sprocket-wheel which drives the music roll.

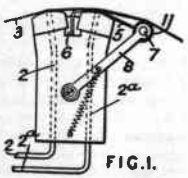
23,448. Boult, A. J., [*Wilcox & White*]. Oct. 13.



Tempo-regulating means; controlling handles.—In a piano-player, a bellows J^7 controls a valve J^5, which governs a port J^3 connecting the passage I leading to the wind-chest B, and the passage K leading to the motor. The position of the valve may be varied by means of a pivoted finger-push N. The bellows J^7 is controlled by a spring mounted on a pivoted block, the position of which can be varied by means of a screw. The push N is connected by links N^2, N^3, N^4 to the movable board of the bellows, so that, by depressing it one way or the other, the valve J^5 may be opened or closed, thereby varying the speed of the motor H. The usual levers F, L, M are provided for operating the expression pedals, and controlling the tempo and rewind valves respectively.

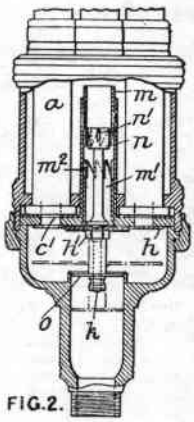
23,865. Fairweather, W., [*Wilcox & White Co.*]. Oct. 18.

Tracker-bars.—Two sets of ducts 2, 2^a are provided for tune sheets of different compasses, and a flexible flap 5 is adapted to cover the set of ducts which, for the time being, is out of use. The flap, which is of double thickness, is secured at its ends between blocks 6, and a rod 7, mounted on pivoted spring-pressed arms 8, is passed through the loop thus formed. A split tube 11 is clipped on the rod to hold the fabric in place, and forms a bearing-surface over which the tune-sheet 3 travels.



24,677. Godin, A. A. Oct. 27.

Wind instruments.—In a multiple horn giving a succession of different notes, distribution of the air is effected by means of a perforated diaphragm to which a reciprocating movement is imparted by the variation of air pressure which movement is arranged to effect its rotation. The diaphragm *h* is mounted on a rod *k*, which carries also a perforated piston-plate *o* and a head *n*. Ribs n^1 on the head *n* engage with crown teeth m^2 on fixed sleeves *m*, m^1 so that the spindle is rotated one tooth each time it is reciprocated by the air issuing from and returning to the bulb. Each step brings one or more ports in the diaphragm opposite ports c^1 leading to the respective horns.



26,003. Atkinson, C. W. Nov. 10. *Drawings to Specification.*

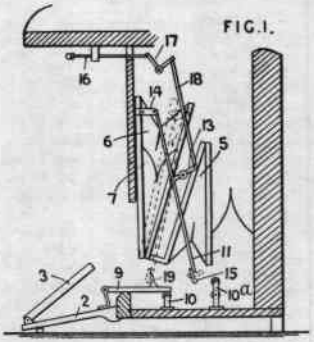
Wind trunks.—In a piano-player or the like operating by suction, an air-tight joint is made between parts which are detachably attached to each other by means of a flexible web, which extends laterally from one part and bears against the other part. When the internal pressure is reduced, the external atmospheric pressure forces the web against the surface of the other part, so forming an air-tight joint. In jointing two wind-trunks, one wind-trunk is provided with a rigid flange, and the other with a flexible web which is held adjacent to the rigid flange. A rigid spring-pressed flange may be provided behind the flexible web.

26,463. Fairweather, W., [*Wilcox & White Co.*]. Nov. 15.

Player-pianos; treadle devices.—The treadles are folded-up by the expansion of the reservoir or by the operation of any other suitable motor. When the handle 16 is pulled out, the motion is transmitted through the levers 17, 13 and link 18 to a link 11 pivoted to a link 14, which is pivotally mounted on the moving board of the reservoir 6. If the bellows 5 are then vigorously operated by means of the treadles 3, the reservoir collapses to the position shown in dotted lines, and a catch 15 on the link 11 engages

a projection 19 on a slide 9, mounted on anti-friction supports 10, 10^a and connected to the pedal-board 2. On the cessation of pumping, the reservoir 6 expands under the influence of

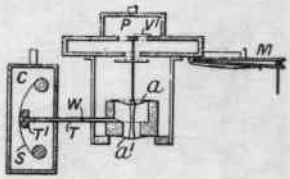
FIG.1.



the spring 7, drawing in the slide 9 and folding up the treadles. The latter may be lowered again either manually or by gravity. By pushing in the handle 16 the catch 15 may be disengaged from the slide 9.

27,559. Gittins, C. E. Nov. 26. [*Addition to* 4532/09.]

Actions; expression, controlling.—Relates to a modification of the pneumatic action described in the parent Specification, in which each valve is operated by two members of different areas controlled by a tune sheet having apertures of



varying size. According to the present invention, one side of each of the members is normally subjected to a greater pressure than the other sides, and the valve is operated when the pressures are equalized. Alternatively, the tracker-bar T^1 may be placed in a chamber C containing air under pressure, and the tune sheet S admits varying quantities of air to the space between the diaphragms a, a^1, the outer surfaces of which are exposed to atmospheric pressure. The valve V^1 is thereby operated to admit compressed air from the chamber P to the note-operating pneumatic M. A bleed-hole W is provided in the tracker-pipe T, through which the air escapes when the tune-sheet closes the tracker-duct.

28,001. Howard, S. Dec. 1.

FIG.3.

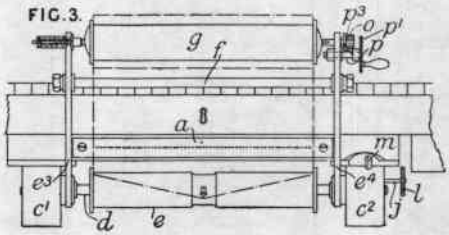
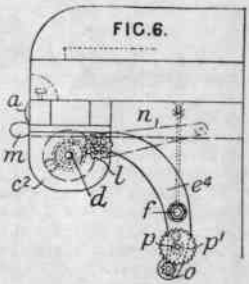


FIG.6.



Player-pianos; blowing and exhausting air; treadle devices; winding-mechanism.—Relates to a mechanical player for attachment to a vertical or grand pianoforte without altering the casing. The tracker-bar a is let into the lock-rail or an attachment to it, and bearings c^1, c^2 for the spindle d of the "take-up" roll e are attached to the underside of the lock-rail. The spindle d carries arms e^3, e^4, which are connected by a rod f, and between which the music-roll g is mounted. The shaft j is driven through a chain n and sprocket-wheel l by the motor, and, during the playing movement, it drives the take-up roll e through spur-gearing. To rewind the tune-sheet, the shaft j is shifted longitudinally by a lever m to disengage the spur-wheels, and the spindle p is pushed in against the action of the spring p^3 so that the music-roll g can be rotated by hand through the spur-wheels p^1, o. The lever m carries a brake spring, which is applied to a spur-wheel on the take-up roll spindle during rewinding. When it is desired to play the instrument manually, the frame carrying the music-roll is either detached or swung round to a position below the key-bed, as shown in Fig. 6, where it is held by the

friction of its pivots or suitable retaining-devices. The bellows are arranged either between the bracings at the rear of the piano or in a casing attached to the back of the piano. Alternatively, they may be placed behind the bottom door of the instrument. The treadles fold into an aperture in the piano casing, which may be closed by a door.

29,357. Sinclair, M. Dec. 15.

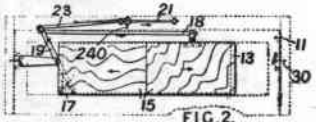


FIG. 2.

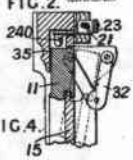


FIG. 4.

Cases; treadle devices. — A musical - instrument or like case is provided with one or more sliding panels, operated by means concealed within the case. In Fig. 2, which illustrates the upper front board 11 of an automatic piano, the board may be removed bodily or swung about its pivots 30, and is provided with an opening 13 normally closed by panels 15. The panels 15 are connected by links 17, 18 to opposite ends of a lever 19, which is pivoted on the front board 11. An operating-handle 240 having a sliding guide-rod 21 is connected to the lever 19, so that by sliding the handle, the panels are simultaneously moved in opposite directions. The handle 240 is normally concealed behind a moulding 35, but, when the board 11 is swung about its pivots 30, the handle is accessible. The link 23 is made of wood or thin metal so that it can twist slightly when the board 11 is moved, and links 32 are provided for limiting the motion of the board. Panels operated in a similar manner by a handle extending through a slot, are provided on the lower front board of the case, and may enclose the treadle mechanism of an automatic piano.

29,975. Metz, A. Dec. 22.

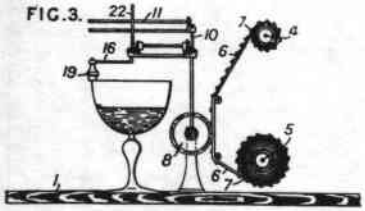
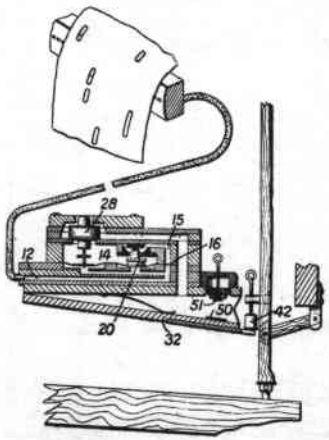


FIG. 3.

Instrument with frictionally-vibrated glasses; actions; tune sheets.—A number of glasses are adapted to be frictionally-vibrated by rubbers mounted on rotating arms. The roller 5 is driven by a clock-work or other motor, and, as it draws the tune-sheet 6 from the roller 4, the teeth 7 drive a toothed wheel 8. This drives vertical and horizontal shafts 10, 11, through bevel-gearing; and the shaft 11 drives a vertical shaft 22 having a cranked arm 16 carrying a rubber or bowing-piece 19 which bears on the rim of a glass. The glasses are arranged in two rows on a base-board 1, and some of the driving-shafts are longer than others. The rubber 19 is provided with a small orifice to which water is supplied through the hole in the shaft 22.

30,124. Sinclair, M. Dec. 24.

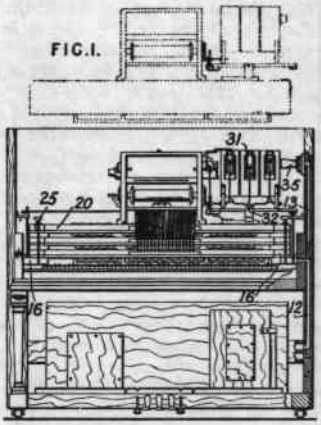
Player - pianos; actions.—In a pneumatic action, a valve is provided which cuts off the bleed-valve passage from the suction chamber before an air impulse from the tracker-bar operates the valve of the striking-pneumatic. The air-channel 12 from the tracker-bar is normally connected with the suction chamber 14



by a small hole in the disk 16. A received air-impulse first operates the valve 20, thus closing the passage 15, and then operates the valve 28 of the striking-pneumatic 32. The movable leaf of this pneumatic operates the abstract through the adjustable disk 42, and carries a pad 50 which co-operates with the spring 51 to produce a cushioning effect.

30,125. Sinclair, M. Dec. 24.

FIG. 1.



Player-pianos; cases; winding-mechanism.—The air-storage is connected with the pneumatic action by the channels 12 formed in the casing of the instrument. The action 20 is removable, and is shown resting on the projections 16 of the casing, the clamp 25 holding it in place. The motor 31 may be made removable with the action, being connected to the channel 13 in the casing by the rubber tubing 35. The motor is of the type described in Specification 414B/05, being pivoted at 32. The upper portion of the Figure shows the removed parts.

30,190. Sinclair, M. Dec. 24.

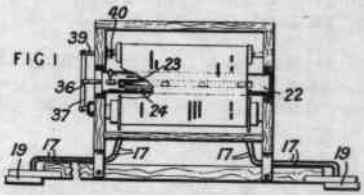
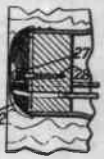


FIG. 3.



Tracker-bars.—A set of sixty-five openings 23 and another of eighty-eight openings 24 are provided. There is a set of lead pipes 17 for each set of tracker openings, and by longitudinal movement of the top of the tracker-bar 22, one or other set of tracker openings is placed in connexion with its corresponding set of pipes 17. The top of the tracker-bar is held in position as shown in Fig. 3, by the screws 28 and springs 27, and can be moved through the levers 36, 37 and 39 by the screw 40. The two connecting-pipes 17 for the same note lead to the same perforation in the bar 19.

To be continued

LETTERS TO THE EDITOR

Member John Warburton of Atherton, Manchester, writes:

Perhaps fellow members will share the surprise with which I read the following item. It comes from a recent publication, *The Complete Encyclopaedia of Motorcars, 1885 - 1968* edited by G.N.Georgano and published in 1968 by Ebury Press, Ltd.

The place of manufacture of the Polymobil car which was made in Germany between 1904 and 1909 is given as the "Polyphon Musikwerke Ag, Wahren". The text continues:

"This firm, known for its precision machine tools, started car production by building the Oldsmobile under licence. It differed in several points from the original design. Most significant was the absence of the curved dash, which was replaced by an additional seat. From 1904 to 1905, this model was known as the Gazelle, later like all other Polyphon cars - as the Polymobil. It was produced until 1908, was quite popular, and was available with wheel instead of tiller steering. A four-seater version was characterised by a bonnet, steering wheel and longer wheelbase. The engine was mounted under the front seat. In 1907, two cars of Polyphon's own design were introduced, the two-cylinder 8/10 PS and the four-cylinder 16/20 PS. After 1909, a new range of models appeared, offered under the name of Dux".

I do not know whether the old music-hall song "In my Merry Oldsmobile" ever featured on Polyphon musical box discs, but it would have been singularly appropriate for it to have done so.

EDITOR'S COMMENT: I am grateful to John Warburton for turning up this delightful piece of information. Polyphon were certainly active in the motor business at least until the outbreak of the Great War and they were granted several patents for automotive goods. I am sure, however, that it comes as news to most of us, myself included, to learn that they actually produced their own complete cars. There is the kernal of an interesting survey here into the diversification which musical box manufacturers underwent when the musical box trade declined. We know that Mermod, Paillard, B.H.A., Manger and others, including Polyphon, made gramophones and that Polyphon actually made gramophone records (see Vol. 2, page 255, letter from Frank Greenacre). Dawkins went into leather goods and as did a number of others wireless and electrical accessories. Regina made floor polishers and vacuum cleaners and suchlike. Most, though, made gramophones to begin with as a first diversification. Here, then, is a subject which some Member might like to follow up and produce an article. A further article might care to deal with what musical box manufacturers were doing before they took up musical boxes. Amongst the names which were to become famous in mechanical musical instruments were bicycle manufacturers, mechanical precision engineers, a medical warehouse, at least one surgical instrument maker, countless horologists - and a maker of table fountains. Here, then, are two projects for the long winter evenings.....

RICHARD STRAUSS RECORDING FOR THE WELTE

From the library of The Editor

HOW TO PLAY THE METROSTYLE PIANOLA AND THE PIANOLA PIANO

THE ORCHESTRELLE COMPANY
135-6-7 NEW BOND STREET
LONDON · W . . . . . .

HOW TO PLAY THE METROSTYLE PIANOLA AND THE PIANOLA PIANO

IN PIANOFORTE-PLAYING by hand the performer must first acquire a certain amount of "technic," after which he is in a position to devote thought and energy to the acquisition and development of "expression."

To play the pianoforte with the aid of the Pianola, it is also necessary to acquire a certain amount of technic; but it is not technic of the ordinary kind.

The word "technic" is found in the vocabulary of every form of art. To the painter and the sculptor it signifies the ability to produce desired effects quickly, by the single stroke of brush or chisel, either delicate or heavy. To the musician it means, broadly speaking, the ability to strike the proper note at the proper time. In fine, technic is neither more nor less than the complete subjugation of the muscles employed, so that they will instantly and accurately do your bidding. Having once obtained the necessary technic, the intellect of the performer assumes control.

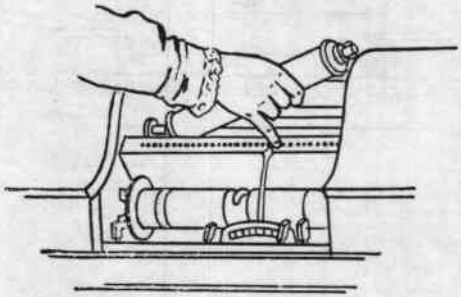
There is absolutely nothing difficult in learning the technic or operation of the Pianola.

A little perseverance, and a close observance of the guide furnished by the Metrostyle, will enable any one to play the compositions desired in an artistic and satisfactory manner. The following instructions, which

are applicable to both the Pianola and the Pianola Piano, should be studied carefully by the beginner :

First, a correct position should be sought.

The feet should be placed squarely upon the pedals, allowing the weight of the legs to rest upon the heels ; then the bench should be pushed away from the instrument until, by bending slightly forward from the waist with outstretched arms, the hands rest comfortably upon the levers.



INSERTING THE MUSIC-ROLL

INSERTING THE MUSIC-ROLL

See that the reroll or lever on extreme right is pushed to left as far as it will go.

Insert the smooth pin on end of roll into the left-hand socket above the tracker-board or row of holes. Push this socket in to permit insertion of grooved pin on the other end of roll into the opposite socket.

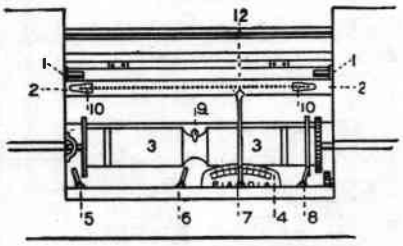
Draw end of music over the tracker-board and under the Metrostyle-pointer and make ring fast to hook on lower or take-up spool.

Push reroll-lever to the right as far as it will go. Take tempo-lever (next to reroll) between thumb and first finger of the right hand and move it to the right.

Pedal gently until the red interpretation-line appears, then move the tempo-lever so that the Metrostyle attached to it points directly over the line. By following this line with the Metrostyle-pointer all the proper

shadings of tempo will be obtained and no other tempo-indications need be regarded.

It should be understood that the guide to expression thus furnished by the Metrostyle is not arbitrary and may be deviated from at the will of the player.



1. SOCKETS FOR MUSIC-ROLL
2. TRACKER-BOARD
3. TAKE-UP SPOOL
4. METRONOME-, OR TEMPO-DIAL
5. SUSTAINING-LEVER
6. ACCENT- OR TOUCH-LEVER
7. TEMPO-LEVER
8. REROLL-LEVER
9. HOOK-ON SPOOL
10. CUT-OFF BRASSES
11. FLANGES
12. METROSTYLE

NOTE.—In the case of Pianolas not equipped with Metrostyles, or when playing rolls which do not have the Metrostyle interpretation-line, the following guide to tempo-regulation is provided:—Besides the regular sheet-music expression-indications, a series of numbers are printed on the roll. When these appear, the tempo-lever should be moved to a position in front of the corresponding number on the tempo-dial. This will give the approximate time in which the passage should be played.

PUMPING

As stated in a preceding paragraph, see that the foot is placed squarely upon the pedal, the toe well up to the front, the weight of the leg resting upon the heel. The pumping motion should be a downward and, at the same time, a forward one, directly from the ankle. Never raise the heel from the pedal, using the whole leg from the hip, as it is wrong and very tiring. The pedals should be permitted to return as high as they will after each stroke.

The best results are obtained in a large measure by the way in which the Pianola is pumped; the pedals should be depressed quickly and strongly enough to always keep the bellows filled with air, increasing and decreasing the force exerted as loud or soft effects are desired.

After reaching the end, throw the reroll-lever to extreme left and pump, using the same stroke as in playing. This is called " rerolling."

It is well to play the same selection several times, until the stroke comes naturally.

Having chosen a roll which is familiar, try to get all the variations desired by pumping strongly and quickly for a loud tone ; slowly and gently for a soft one ; always, however, keeping the bellows full enough of air to maintain the tempo.

Having learned this, the rest is simple. Play through a number of familiar rolls, endeavouring in each to see how many effects you can make by merely using the feet.

TEMPO-LEVER

TO WHICH IS ATTACHED THE METROSTYLE

This lever governs the time ; moving it to the right increases and to the left decreases it. A full stop or rest is obtained by throwing the lever to the extreme left.

By moving the tempo-lever so that the Metrostyle points to the red interpretation-line which appears on the revolving music-sheet, the proper tempo in which the piece should be played is secured.

The performer should always have this lever under control, moving it to left or right, as the interpretation-line on music-roll or personal taste dictates. This prevents a mechanical rendition.

The Pianola in no way hampers the player's individual interpretation of a musical work, merely acting as an aid to its execution, while the " Metrostyle" upon the Pianola renders a perfect and artistic interpretation possible to every one.

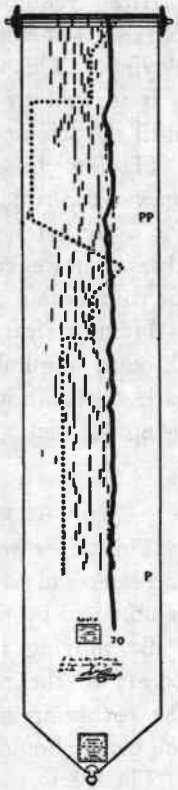
THE METROSTYLE, OR INTERPRETATION-LINE

Music, like verse, consists of a succession of phrases, and it is absolutely essential to artistic playing that these be punctuated.

This is accomplished by retarding, accelerating, resting, and accenting, and it is the office of the

Metrostyle to show where these effects should be introduced.

By following the interpretation-line with the Metrostyle the player is enabled to produce the same artistic results as the musician who originally marked the line on the roll, and as this work is always done by an authority and often by the composer, the value of the Metrostyle is obvious.



The colour of the Metro-style-line on the music-roll is red

SECTION OF METRO-STYLE MUSIC-ROLL, SHOWING METRO-STYLE-LINE

THE SUSTAINING-LEVER

The sustaining-lever at the extreme left operates directly upon the sustaining-pedal on the piano.

This pedal is often erroneously called the "loud" pedal. When pressed down, it has absolutely no effect upon the amount of tone. It raises the felts or dampers from the strings of the piano, thus allowing the strings to continue to vibrate, giving a sustained ringing tone. Loudness depends on the amount of strength expended in striking the key, not upon putting on the so-called loud pedal.

Only a few positive instructions can be given regarding the use of the sustaining-lever, as its use is an innate art, and no two piano-virtuosi were ever known to agree regarding it.

It can be used with good effect upon rising and descending scales and arpeggios, also on naturally long tones and chords. However, care should be taken never to leave it on while succeeding non-harmonic chords are sounding, as only a blur is heard. Do not be afraid to use it when playing softly, as many of the finer modulations of tone-colour can be obtained in this manner. It is better to use this lever too little than too much.

TOUCH- OR ACCENT-LEVER

Second lever from the left. This lever, operating as it does upon the naturally elastic properties of the air, is a means of imparting to the performance a "touch" which has all the qualities of the human fingers, and completes the connection between the mind of the player and the keys of the piano.

The lever called the "touch-" or "accent-" lever, controls the air supplied to the felt-covered fingers. When in its normal position—*i.e.*, to the right—it has no effect upon the supply ; but when drawn to the left it cuts off more and more air, giving a softer tone, until, reaching the end of its slot, the air is almost entirely cut off. This gives a very soft touch, no matter how hard one may pump.

This lever should be used in conjunction with the method of pumping given, allowing it to go to the right for a loud tone, to the left for a soft one, and holding it in reserve for the sudden changes of tone from soft to loud.

To accent with this lever, hold it almost, or quite, to the extreme left, and release it just as the note or chord you wish to accent reaches the row of holes in the tracker-board ; then return it to first position, to keep succeeding notes from also sounding loud. This action releases the pent-up air only at that point, causing the finger over the key to strike harder, giving more tone.

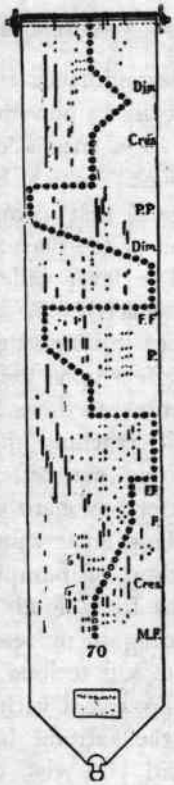
Melodies, no matter how involved, can be brought out in this manner, making them sound louder than their accompaniments, thus giving an effect very much desired.

THE MODULATION-LINE

The modulation-line—a series of blue dots printed upon the roll—is necessary to those who cannot depend upon their ear or are unfamiliar with the selection. It enables them to play with proper modulation. It shows the player when to play loudly, softly or moderately.

The modulation-line runs straight on the sheet in five places, viz. : on extreme left, which denotes that the tone should be pianissimo, PP. (very soft) ; one-quarter the way over to the right, P. piano (soft) ; one-half or in the middle, M.F. mezzo forte (medium loud) ; three-quarters, F. forte (loud) ; extreme right, FF. fortissimo (very loud).

The sharpness of the angle with which the line runs from side to side denotes the slowness or suddenness with which the tones are to be changed, viz. : if the line is at the left in the first space and gradually approaches the right, a gradual crescendo or increase in tone is intended. If the line runs in a sharp oblique either way, a more sudden change should be made. If directly horizontal, make the change quickly. This can be done with the accent- or touch-lever instantaneously.



SECTION OF REGULAR MUSIC - ROLL, SHOWING MODULATION-LINE

The changes in the direction of the modulation-line, as well as all other expression-marks, are noted as they pass over the tracker-board or row of holes. This gives the player time for preparation, as they are in sight a moment before they become effective.

The modulation-line will not be confused with the tempo- or interpretation-line on the rolls marked for the Metrostyle Pianola, as the latter, instead of being a succession of dots, is a continuous red line, and only moves within the compass of the Metrostyle-pointer on the tempo-lever.

On the Pianola, the expression-levers are so placed that the player's fingers rest on all of them at the same time ; and as these levers act instantaneously, the player has the same artistic control of the music when the Pianola is used as when the human fingers strike the keys.

Following are a few general suggestions on the way to interpret or render a selection :

First. Do not play too loudly.

Second. Do not be afraid to give a composition your own individuality.

Third. Do not raise the whole leg in pumping ; use merely the foot from the ankle.

Fourth. Do not work too hard.

MUSICAL TERMS

Tempo	The time in which a selection is to be played.
Rit.	Ritardando—gradually slower.
Accel.	Accelerando—faster.
Dim.	Diminuendo—diminished volume of tone.
Largo	The slowest time of all.
Adagio	A very slow time.
Andante	Slow.
Andantino	A little faster than andante.
Moderato	Moderate.
Allegro	Rather quick.
Allegretto	A trifle slower than allegro.
Vivace	Bright, vivacious, quick.
Presto	Very fast.
Lento	A little slower than the preceding tempo.
PP.	Pianissimo—very, very soft.
P.	Piano—soft.
F.	Forte—loud.
FF.	Fortissimo—very, very loud.
Mezzo	(Half) medium. Thus : Mezzo forte (MF.) —medium loud ; mezzo piano (MP.) —medium soft.
Accent <	Accent.
Cres.	Crescendo—gradually louder.
Fermata ·)	Hold the tone—accomplished by stopping the music momentarily.

THE GAS-FLAME ORGAN

On page 9 of Volume 1, Number 3 of The Music Box, and also on page 4 of Number 5 of the same volume, reference was made to the Lustre Chantant or "singing lamp", an example of which is preserved today in the South Kensington Science Museum. The first person to discover that a burning jet of hydrogen in a glass tube produced a musical sound was Dr. Bryan Higgins (b.1737; d.1820) in the year 1777. This phenomenon was examined further by Brugnatelli, Pictet, De la Rive, and Faraday. Faraday considered that the sounds were produced by the gas not burning silently, but with a series of explosions which, although inaudible in the open air, were rendered audible when the gas burned in a tube by means of the resonance of the tube.

The following article was published in a work entitled "Cyclopaedic Science Simplified" by John Henry Pepper (b.1821; d.1900) who was a well-known figure at the Royal Polytechnic Institution and is perhaps better remembered today for his clever stage illusions, particularly the so-called "Pepper's Ghost". The work dates from about 1870.

It is not every glass tube that will resound or sympathize with the explosions of the gas; but, generally speaking, it is easy to obtain them, and, as Mr. Barrett remarked in his lecture given before the Dublin Royal Society, "thus rough and rude taps and hard and harsh explosions can be chased into perfect melody by mere rapidity of succession.

"The condition of the flame when burning within the tube is shown by a moving mirror. It was seen that when the flame was silent and the mirror moving, a band of light was produced; but when the flame was sounding, this luminous ribbon was broken up into a series of disjointed images of flame. The effect of lengthening the tube in which the flame was burning was next shown, and a series of gas jets burning within glass tubes of varying length gave a corresponding series of musical notes of varying pitch. By placing the finger upon the top of these tubes, the sound could be quenched, and thus a novel musical instrument could be constructed. From glass tubes

the lecturer passed on to show the effects of flames burning within extremely long tin tubes. Within a tube 6 ft. long and about 1½ in. in diameter, the flame of a large gas-burner gave a loud, unmusical roar. By adding to the end of this tube a glass chimney, it was seen that when the flame was sounding it was broken up into wild confusion. By enclosing a still larger gas-flame from a huge Bunsen's burner within a tube 18 ft. long and 3 in. in diameter, a deep roar was obtained, intermingled with loud reports similar to the discharge of musketry.

"Returning once more to the gentler music of the small glass tubes, two flames, enclosed in their respective tubes, were taken and made to emit notes of the same pitch. This point was gained by shifting to and fro a paper slider, which moved stiffly at the upper extremity of one of the tubes. When the notes were nearly in unison a series of intermittent sounds or *beats* were obtained, due, as is well known, to the mutual extinction at certain intervals of the two sounds. Corresponding beats were obtained from two organ-pipes and two tuning-forks nearly in unison. One of these tuning-forks, mounted on its resonance case, being silent, the other, unmounted, was now struck, and its prongs brought near to, but not touching, those of the first fork: at first no sound could be heard, but by degrees the unmounted fork transferred its motion to the mounted one, and the sound of the latter slowly welled forth. The sound of the voice can thus be transferred to the strings of a pianoforte, and in the same way a flame can be made to accept and resound to a note of the proper pitch. This was illustrated as follows:—A singing flame, by adjusting the paper slider, was tuned to the note of a certain fork; the tube was then raised slightly, so that the sound could be quenched by momentarily placing the finger on the top of the tube. On now striking the fork, and

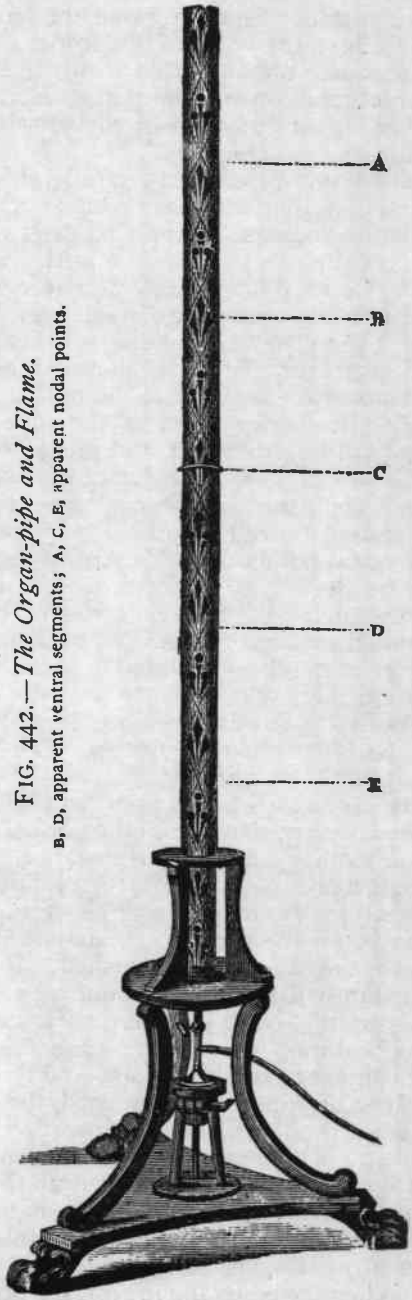


FIG. 442.—*The Organ-pipe and Flame.*

B, D, apparent ventral segments; A, C, E, apparent nodal points.

holding it over a resonant jar, the flame instantly started into song. The same effect was shown by the syren, and also by the human voice. Retreating to some distance from the flame, the latter could be made to respond at pleasure by pitching the voice to the proper note, whilst it remained utterly unaffected by any note not in unison with itself. Musicians would find such a flame a faithful monitor in training the voices of their pupils."

The apparatus used by the writer at the Polytechnic is shown on the preceding page. (Fig. 442.)

The organ-pipe was 15 ft. in length, and emitted a fine deep sound when an Argand burner was used, whilst with a large Bunsen's burner the sound rose with the increased supply of gas to a roaring noise, which reminded one of the vocal powers of the lion at the Zoological Gardens, just before the tantalizing (to him) bits of raw meat are served for his dinner.

The beats were very distinct; and on one occasion the writer noticed that, whilst the pipe was sounding, the heated air appeared to divide itself into ventral segments and nodal points, the latter being apparently discoverable by the increased heat where the hot air remained at rest, as at the nodal points, whilst the cooler parts of the pipe might be the ventral segments, where agitation mixed the air, and prevented that quiescence which would give time to the air to give out its heat to the sides of the pipe; but, curious to say, this result could not be obtained again, and, therefore, the absolute proof that a column of heated air can divide itself into waves emitting a greater heat at the nodal points than the ventral segments remains yet to be obtained.

Mr. Becker, of Elliott's, who constructed the organ-pipe apparatus, also arranged for the writer a series of brass tubes increasing in length, having inside them small Bunsen burners, and producing, when the valves fixed to the top of each tube were lifted by strings attached to a key-board, the notes of the gamut. (Fig. 443.)

With this gas-flame organ Herr Shalckenbach, the much-respected organist of the Polytechnic, could play simple tunes, to the great admiration and delight of the youthful spectators.

It has already been remarked that the gas-flames do not give out or produce sound, except they are clothed or surrounded with a tube made of glass, metal, or any other convenient substance. The curious jumping up and down of a single flame that precedes the evolution of sound has been ascribed (as already stated) by Faraday to a series of explosions. The writer is inclined to doubt this being the correct explanation, because whenever a true explosion takes place, the flame is extinguished. It has more to do with the current which is constantly dragging the flame upwards, and the fire is as constantly running downwards to the jet: here are a series of impulses, an up-and-down motion, or vibratory power, sufficient to set the air into waves, which are communicated by contact to the glass tube, and this, by resonance, produces the sound.

If an Argand burner be used, the flame is quite different: whilst the sound is being produced, the flame overflows the outside of the ring, and, burning very blue, shows the rapidity of the current of air. It seems to be beaten downwards, as if one current of air passed up the centre of the Argand tube, and another came down outside; but there is not any indication of an explosion, except when the interior of the tube is corked or stopped, and then the flame is continually extinguished by explosions.

When tested by the mirror, the streak or band of light is continuous: there are no breaks as with the single flame because that is prevented by the com-

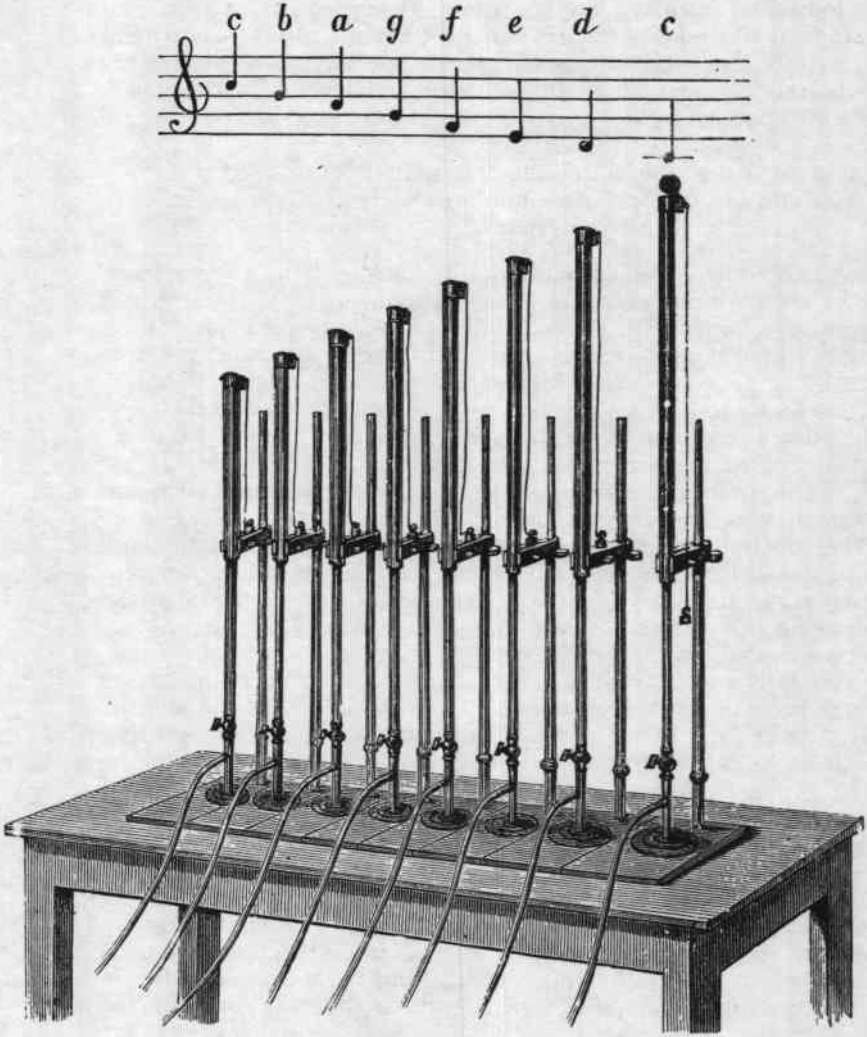


FIG. 443.—*The Gas-flame Organ.*

plete combustion of the gas; there is no jumping up and down and intermittent combustion,—it is continuous; and yet sound is evoked. The ring of burning gas is violently agitated by the current of air in the tube; it is constantly wishing to rise, and is as constantly beaten down; thus it is the current of air that determines the whole effect, and there are no explosions whatever. If one really occurs, the flame is blown out, as might be expected. It is probably intermittent combustion which sets the air vibrating.

To show how completely the sound is affected by the rate or rapidity of the

current of air, the writer used a single jet and flame, so arranged that it could be bent down to any angle to the perpendicular with the tube surrounding it. The flame emitted sound at an angle of 60°, but every degree after it decreased, until at 50° it stopped and refused to vibrate; and when the tube was horizonal, the flame, as might be expected, stopped singing altogether, and clung to the upper part of the tube. The reader will, no doubt, be interested with extracts from Faraday's own paper,

"ON THE SOUNDS PRODUCED BY FLAME IN TUBES, &c.,
"By M. FARADAY, Chemical Assistant in the Royal Institution.
"May 11, 1818.*

"There is an experiment usually made in illustration of the properties of hydrogen gas, which was first described by Dr. Higgins in 1777, and in which the tones are produced by burning a jet of hydrogen within a glass jar or tube. These tones vary with the diameter, the thickness, the length, and the substance of the tube or jar, and also with the changes of the jet. After Dr. Higgins, Brugnatelli, in Italy, and Mr. Pictet, at Geneva, described the experiment, and the effects produced by varying the position of the jet and tube; and M. de la Rive read a paper at Geneva in which he accounted for the phenomena by the alternate expansion and contraction of the aqueous vapour. That they are not owing to aqueous vapour, from some experiments to be described, I have no doubt: they are caused by vibrations similar to those described by M. de la Rive, but the vibrations are produced in a different manner, and may result from the action of any flame. I was induced to make a few experiments on this subject. That the sounds were not owing to any action of aqueous vapour was shown by heating the whole tube above 212°, and still more evidently by an experiment in which I succeeded in producing them from a jet of colza oil gas. That they do not originate by vibration of the tube, caused by the current of air passing through it, was shown by using cracked glass tubes—tubes wrapped in cloth; and I have obtained very fine sounds by using a tube formed at the moment by rolling up half a sheet of cartridge paper, and keeping it in form by grasping it in the hand.

"Sir H. Davy has explained the nature of flame perfectly, and has shown that it is always a combination of the elements of explosive atmospheres. In continued flame, as of a jet of gas, the combination takes place successively and without noise as the explosive mixture is made. In what is properly called an explosion, the combination takes place at once throughout a considerable quantity of mixture, and sound results from the mechanical forces thus suddenly brought into action, and a roaring flame presents something of the appearance of both. Now, this I believe to be exactly analogous to that which takes place in what have been called the singing tubes, but in them the explosions are generally more minute and more rapid. By placing the flame in the tube, a strong current of air is determined up it, which envelopes the flame on every side. The current is stronger in the axis of the tube than in any other part, in consequence of the friction at the sides and the position of the flame in the middle and just at the entrance of the tube. An additional effect of the same kind is produced by the edge obstructing the air which passes near it. The air is, therefore, propelled on to the flame, and, mingling

* "Quarterly Journal of Science," Vol. V.

with the inflammable matter existing there, forms portions of exploding mixtures, which are fired by the contiguous burning parts, and produce sound in the manner already described with a roaring flame, only the impelled current being more uniform, and the detonations taking place more regularly and in smaller quantities, the sound becomes continuous and musical, and is rendered still more so by the effect of the tube in forming an echo.

"That the roaring flame gives sound in consequence of explosions can hardly be doubted.

"An experiment may be made with coal-gas. Light a small Argand burner with a low flame, and bring a glass tube, which is very little larger than the diameter of the flame, down upon it so as nearly to include it. The current of air will be impelled upon the external part of the flame, it will remove the limit of combustion a little way up from the burner, that part of the flame will vibrate rapidly, burning with continued explosions, and an irregular tone will be obtained. Remove the burner, and attach a long slender pipe to the gas-tube, so as to afford a candle-flame that may be introduced into the tube. Light it and introduce it about five or six inches. and a clear musical tone will be obtained."

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