No. 726,676. PATENTED APR. 28, 1903.

E. B. & M. F. GREGOR.

PERFORATOR FOR MUSIC ROLLS.

APPLICATION FILED FEB. 24, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

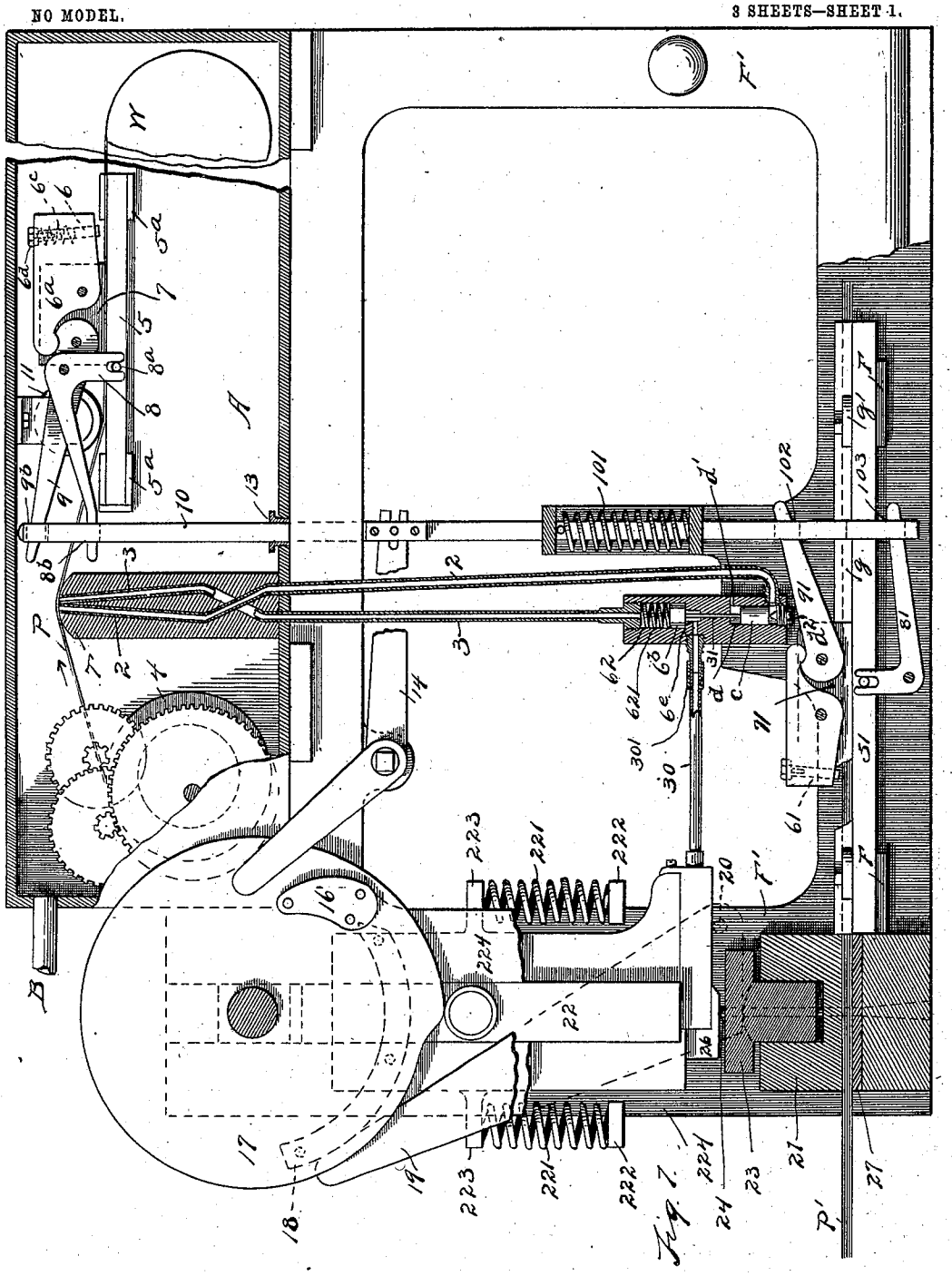


Fig. 1.

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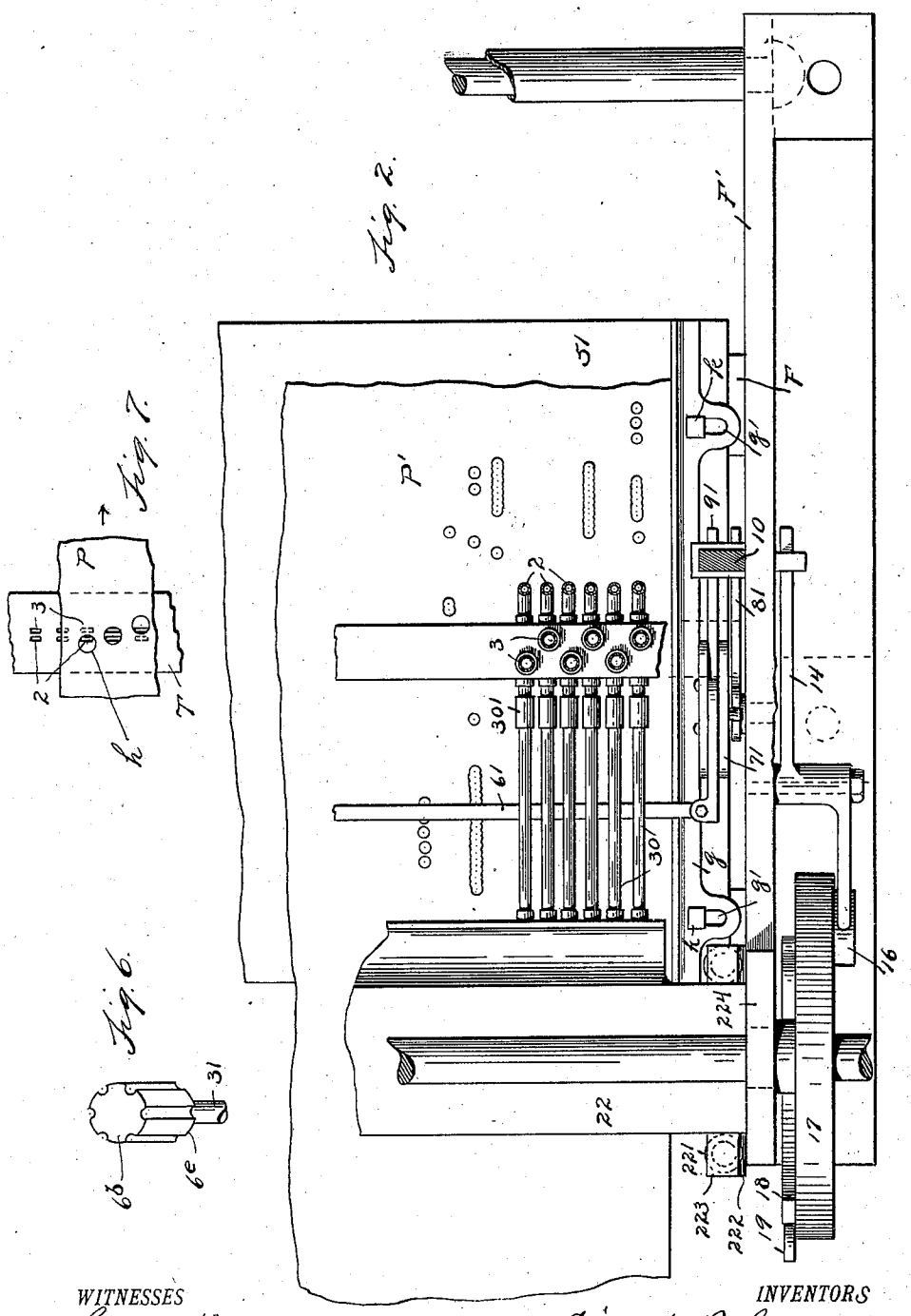
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NO MODEL. 3 SHEETS—SHEET 2.



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NO MODEL. 3 SHEETS—SHEET 3.

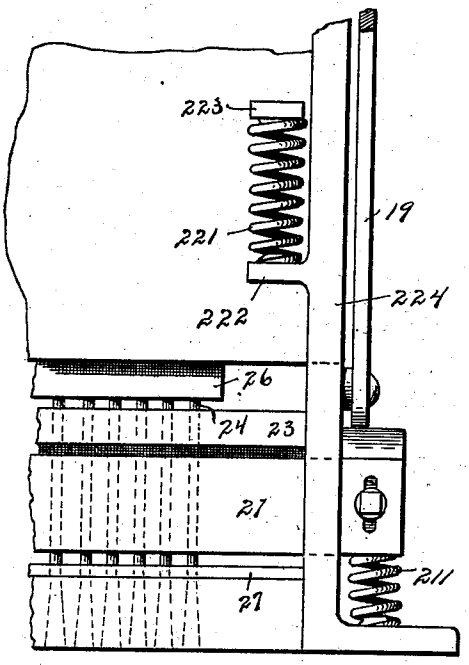


Fig. 3.

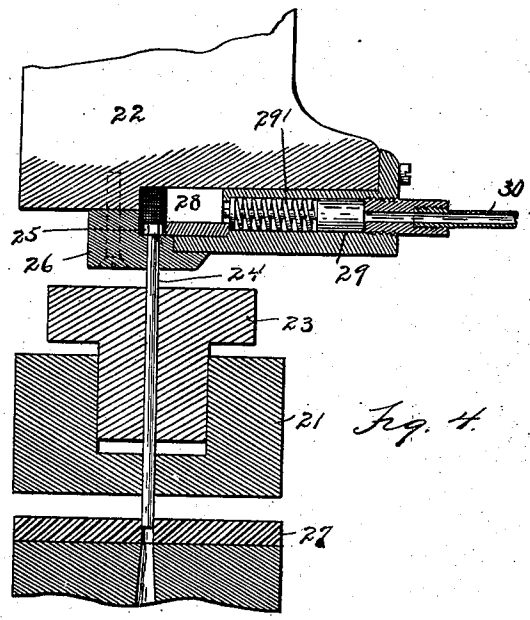


Fig. 4.

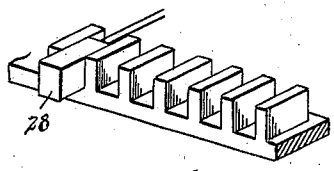


Fig. 5.

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UNITED STATES PATENT OFFICE.

ERNEST B. GREGOR AND MAXIMILLIAN F. GREGOR, OF DETROIT, MICHIGAN.

PERFORATOR FOR MUSIC-ROLLS.

SPECIFICATION forming part of Letters Patent No. 726,676, dated April 28, 1903.

Application filed February 24, 1902. Serial No. 95,146. (No model.)

To all whom it may concern:

Be it known that we, ERNEST B. GREGOR and MAXIMILLIAN F. GREGOR, citizens of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Perforators for Music-Rolls; and we declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to an improved apparatus for perforating paper, and has for its object an improved machine arranged to perforate the rolls or sheets of paper used in pneumatic musical instruments.

In brief, the machine is one in which there is a constantly-moving actuating and driving wheel or shaft which acts to produce an intermittent feed motion of a pattern-sheet over the tracker-board opening or over an opening in a board which may be compared to the tracker-board of a musical instrument.

The constantly-moving shaft gives motion to a cam or number of cams that produce a step-by-step movement not only of the paper above mentioned, but of a second sheet of paper or a pile of sheets of paper which are to be operated upon by punches. The shaft also actuates a cam which intermittently actuates a punch-plunger, and it also actuates a presser-foot that holds the bundle or pile of paper under proper pressure to be treated by a punch that advances through the paper and then is retracted from the perforation made in the paper. The step-by-step movement of the pattern-sheet and the step-by-step movement of the bundle of sheets under treatment are contemporaneous, and the punch is actuated during the intermission of the forward movement of the paper.

There are a number of punches all arranged under the same punch-actuating bar; but no one of the punches is ever directly in contact with the bar employed to push it through the paper, but is only indirectly in contact therewith. Between the bar and each punch is a space which is filled by a block when the bar actuates the punch, and this block is pushed into position by an air-pressure-actuated piston. The pattern-sheet serves as a valve to determine when the air-pressure will be exerted and what punches will be brought into action.

In the drawings, Figure 1 is a side elevation with some parts broken away. Fig. 2 is a plan view with the air-box A of Fig. 1 removed. Fig. 3 is a detail showing a portion of the presser-foot and the punch-bar. Fig. 4 is a detail showing a punch, a cross-section of the punch-bar, a block, and the end of the air-tube, and the air-piston which actuates the block. Fig. 5 is a perspective showing a block and a series of block-guides. Fig. 6 is a detail of the valve 6 of Fig. 1. Fig. 7 shows the relation between the pattern-sheet and the openings into the tube in the tracker-board.

T indicates the tracker-board, which has a curved upper surface, in the extreme summit of which are the mouth-openings of two tubular air-conductors 2 and 3. In front of the tracker-board is a drum 4, mounted in suitable bearings and arranged to be turned by pulling paper P from it against the tension of a spring. The shaft of the drum and the shaft of the spring-barrel are connected by a chain of gearing. The paper pattern P passes over the tracker-board and under a gripping apparatus, which will be described more fully, and to a winding-drum W, that is also connected with a spring by a chain of gearing. The two drums, with their gearing and winding appliances, do not form in their details any part of this invention, but are used to keep the pattern-paper tight and hold it in close connection with the upper surface of the tracker-board, over which the paper passes. On the rear side of the tracker-board is a paper-feeding mechanism, consisting of a slide 5, on the upper side of which the paper P lies. The slide 5 rests on ways 5^a, that are secured to the frame. A slide-actuating bent lever 8 is pivoted to the frame. One end of this lever engages a pin 8^a on the slide and the other end engages through a slot 8^b in a vertically-movable link 10. A lever 9 is pivoted to the standard 7 and engages under a rock-arm 6^a, that carries a suspended grip-bar 6. The end of lever 9 en-

gages through a slot 9^b in link 10. The slots 8^b 9^b are arranged with respect to the levers that engage through them to actuate the lever 9 and grip-bar 6 before the free movement of the slide takes place, and the pressure is continued during the time of the feed movement. There is a relief-spring 6^c on the hanger 6^d, which carries the grip-bar 6.

The paper P passes under a roller 11, which keeps it always at a fixed angle with respect to the upper surface of the tracker-board.

The paper, the two drums on which it is stored, the upper end of the tracker-board, and the feeding device now mentioned are all contained in an air-tight box A, which is provided with an air-inlet B, and air is compressed into this box by any suitable air-compressor. The link 10 projects into the box through a suitable stuffing-box 13, and below the box the link 10 engages by a slide or pin connection with a lever 14, the opposite end of which is arranged to engage with a cam-actuator. A spring 101 is arranged to normally urge the link 10 to its raised position, in which position the gripping device of the paper-feed is free from the paper. The link 10 at its lower end engages with a second paper-feeding device similar in construction to the one already described, in which there is a slide 51, actuated by a lever 81, that engages through a slot in the link 10. The paper is gripped to the slide by a grip-bar 61, actuated by a lever 91, and the rock-arm which supports the bar 61 and the lever 91 are both pivotally supported on a standard 71. The slide itself is supported on ways on the main framework F. The engagement of the lever 91 with the link 10 is through a slot 102, and the engagement of the lever 81 with the link 10 is through a slot 103 in the link 10. The length of the slots is arranged to time the action of the levers properly, so that the feed movement or forward movement of the slide takes place only after the grip-bar 61 has been brought into gripping contact with the paper over the slide, and the movement is also timed by the location of the cam 16 on the cam-wheel 17 and cam 18 on the cam-wheel, as will be hereinafter described.

The cam 16 engages the arm of the lever 14, actuates that lever and the link 10. The cam 18 engages the stem of the presser-foot 19, which is pivoted by pin 20 to the frame and forces down on the paper a presser-bar 21. The cams 16 and 18 are arranged to time the movement of the presser-bar 21 and the lever 14 and the parts actuated by it, so that pressure is released under the bar 21 when the paper is gripped and moved forward by the feeding mechanism hereinbefore described.

The wheel 17 is itself a modified snail cam (the approach to the high part is not a complete spiral) which actuates a plunger 22. The plunger 22 has one reciprocation with each revolution of the wheel 17. The lever 14 has one reciprocation and the parts actuated by it one action with each revolution of the wheel 17, and the presser-foot 19 has one reciprocation, one period of pressure, and one period of release during each revolution of the wheel 17. The bar 21 is lifted by a spring 211. The punch-plunger 22 is lifted by springs 221, which rest on brackets 222 on the frame and rest under brackets 223, that project from the body of the plunger between guides 224. The presser-foot 21 embraces a punch-guide 23, which is fixed to the frame F and through which there are a large number of perforations and through which engage a large number of loose punches. Each punch 24 is provided with a head 25, that engages over the upper side of a lifting-bracket 26 on the plunger 22. The bracket 26 lifts the punches, so that the lower end rises from the die-block 27 through the paper P′ and into the presser-foot 21; but the head 25 never engages directly with the lower end of the punch-actuator 22. The punch and the punch-actuator engage indirectly through an interposed block 28, and the block 28 is interposed only when the paper P has taken a position over the tracker-board to allow the air-pressure in the box A to pass down through the pipe 2 and actuate the piston 29 at the end of the tube 30. There are two tubes 2 and 3, having their upper mouths or inlets in the summit of the tracker-board. The mouth-openings are small and substantially rectangular in shape rather than round, each mouth-opening occupying only about one-third of the diameter of the single punch-hole. The two mouth-openings lie quite close together, (see Fig. 7 in connection with Fig. 1,) and it requires three step advances of the paper for a hole made by a single punch movement to pass across the mouth-opening. As the paper advances and the hole *h* uncovers the mouth-opening to the tube 2 the air passing down the tube 2 lifts a small piston *c* in a cylinder *d*, with which the bottom of the tube 2 communicates. The piston *c* is connected by a stem 31 to a valve 6^b in a cylinder 62, which is axially in line with the cylinder *d*. The lifting of the valve 6^b is against the tension of a spring 621. The valve 6^b is provided with a face 6^e, which normally closes the outlet-passage into the tube 30 and opens the passage when the valve 6^b is lifted. The valve 6^b is provided with side passages, (as though it were a wing-valve,) which allow the air to pass down through the pipe 3, by the valve, and into the pipe 30 when the valve is lifted.

When the paper has at one forward movement opened the inlet into the tube 2 and has in consequence enabled the air to act on the valve 6^b, lift it, and make a free opening through the passage 3 and 30, now makes its next advance and opens the mouth of the tube 3. The air passes down through the tube 3, by the valve 6^b, through the tube 30, actuates the piston 29 against the tension of spring 291, and pushes the block 28 over the top of the punch 25. This punch will now be

actuated by the plunger 22 and will be repeatedly actuated so long as the block 28 remains in position over the head in the punch, and this will continue so long as the air passes freely through the perforations *h* in the paper P and through the tube 3. The perforation made through the paper P′ will therefore correspond exactly in length to the perforation *h* through the paper P, provided, of course, that the punch used in making the hole *h* was of the same size as that used for making the second sheet, and if the punch differed in size the holes will be of the same relative proportion.

There are a number of punches and fillers or blocks, a pair for each note of the instrument for which the sheet is perforated. A finished sheet will be adapted to be used with the same instrument that the pattern-sheet can be used with.

Inasmuch as after the setting of the pattern-sheet over the tracker-board and the placing of the sheets to be perforated the action is entirely automatic and requires only a source of power to produce a constant rotation of the shaft and wheel 17 and a constant pressure of air in the box A, the resulting sheets of music-paper can be made with great rapidity and with great uniformity. Moreover, the punched sheets may be quite numerous, depending somewhat on the thickness of a single sheet; but we have found it possible to produce fifty sheets at a single time, all corresponding exactly to the pattern-sheet.

The sheets are guided in their travel between side guides *g*, one of which is shown in Fig. 2, and they are arranged to be adjusted by screws *k*, that engage through slotted ears *g′*.

The cylinder *d* is provided with a vent or escape for any leakage through the vent-hole *d′* and is provided with means for adjusting the piston *c* and the valve 6^b by a pointed screw d^2, that closes the end of the cylinder *d*. The pipe 30 is connected to the nozzle from the cylinder 62 by a flexible connection 301, that permits the end of the pipe 30 to move sufficiently to comply with the requirements of motion incident to action of the plunger 22.

What we claim is—

1. In a machine for perforating paper, the combination of means for advancing a pattern-sheet, means for advancing the sheet to be perforated, means for reciprocating a punch-actuator, an air-pipe the mouth of which is arranged to be closed by the imperforate part of the pattern-sheet, and to be open on the passage of a hole over the pipe, an air-valve arranged to be actuated by air passing through said pipe, a punch in line with the punch-actuator, a block adapted to be interposed between the punch and the punch-actuator and means for actuating the block comprising an air-actuated piston, a cylinder containing said piston, an air-pipe leading thereinto from an opening through the tracker-board, a valve in said pipe, a piston to actuate the valve and a pipe leading thereto from the same opening through the tracker-board, substantially as described.

2. In a machine for perforating sheets of paper, the combination of a punch in line with a reciprocating actuator therefor, an air-actuated block arranged to be projected between the punch and its actuator, a pair of air-conducting pipes arranged to register with a single opening through the pattern-sheet, a piston actuated by air traveling through one of said pipes, and a valve actuated by air traveling through the other of said pipes, substantially as described.

3. In a machine for perforating paper, the combination of an air-trunk, mechanism contained in said air-trunk for producing a step-by-step advance movement of a pattern-paper, a double outlet for air from said trunk arranged to be closed by the imperforate part of the pattern-sheet and to be opened by the registry of holes therein over the outlet-opening, a reciprocating punch-actuator, a punch in line therewith, a block arranged to be projected between the punch-actuator and the punch, a valve controlling the passage of air to the block-actuator, means whereby air passing through a perforation in the pattern-sheet divides and one part is utilized to set the valve and another part actuates the block to project the same, substantially as described.

4. In a machine for perforating paper to correspond with a previously-prepared paper pattern, the combination of contemporaneously-acting mechanism for advancing the paper and the pattern, mechanism for producing the regular reciprocation of a punch-actuator, a punch normally out of contact with the actuator but arranged to be actuated thereby by the interposition of a block between the punch and its actuator, and means for admitting air under pressure through a perforation in the pattern-sheet, dividing the air and utilizing one part to open a valve to admit another part of said air to actuate the block and project it between the punch and its actuator, substantially as described.

5. In a machine for perforating paper for sheet-music, the combination of a tracker-board provided with air-tubes, a valve actuated by air passing through one of said tubes, a piston actuated by air passing through the other of said tubes, means projected by said piston whereby a constantly-reciprocating plunger actuates a punch, substantially as described.

6. In a machine for perforating sheet-music, the combination of a tracker-board arranged for the passage thereover of a pattern-sheet, air-passages in said tracker-board, a piston arranged to be actuated by air passing through one of said tubes, and a valve in said tube arranged to be actuated by air passing through the other of said tubes, substantially as described.

7. In a machine for perforating sheet-mu-

sic, in combination with a punch, a punch-selector, a tracker-board, means for advancing a perforated pattern-sheet over the tracker-board, a pair of air-tubes opening into the tracker-board, a valve controlling the passage through one of said tubes, means actuated by air passing through the other of said tubes to operate said valve, means actuated by air passing through the first of said tubes to operate the selector, substantially as described.

In testimony whereof we sign this specification in the presence of two witnesses.

ERNEST B. GREGOR.
MAXIMILLIAN F. GREGOR.

Witnesses:
MAY E. KOTT,
CHARLES F. BURTON.