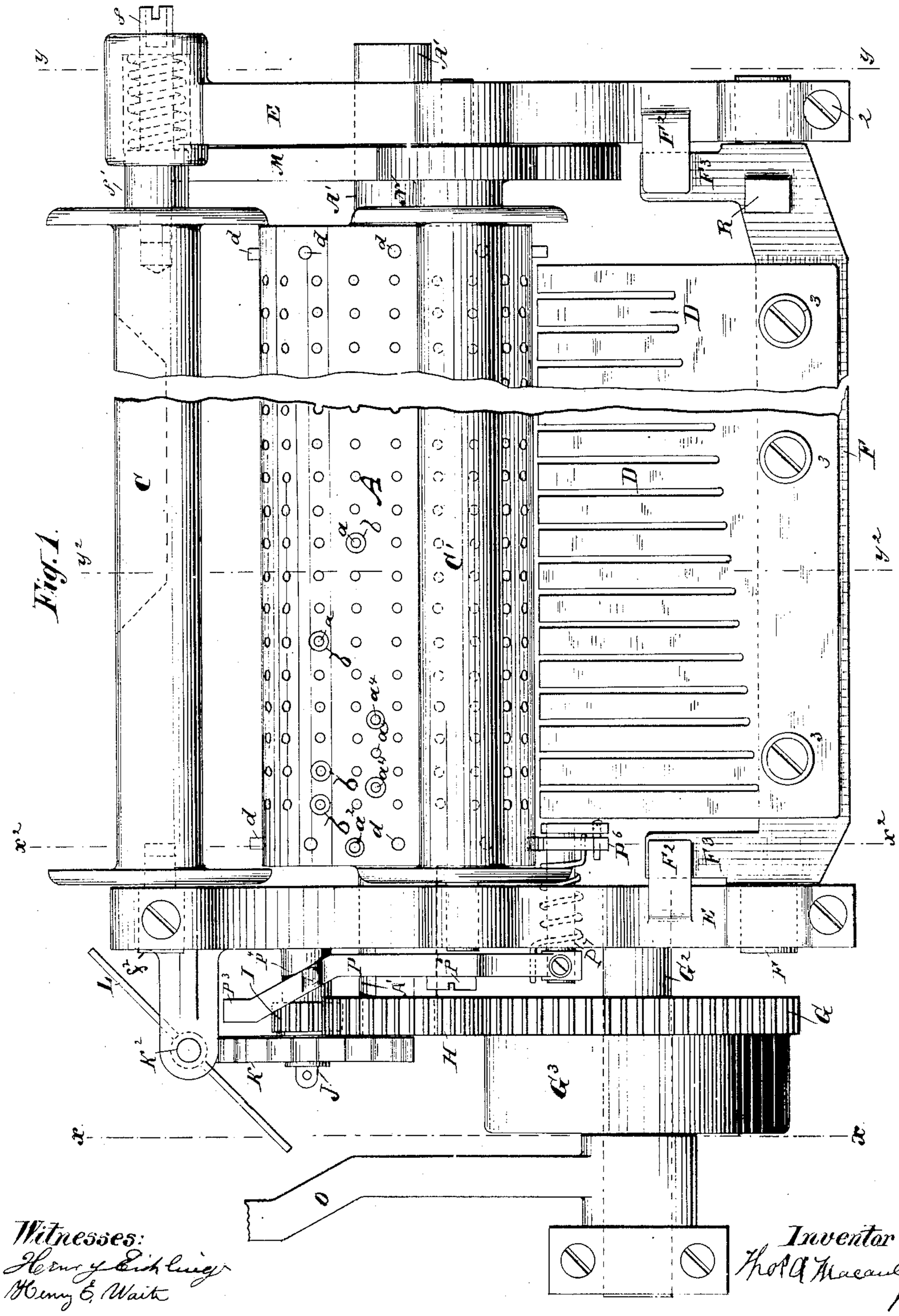
(No Model.) 4 Sheets—Sheet 1.

T. A. MACAULAY.

AUTOMATIC MUSICAL INSTRUMENT.

No. 401,187. Patented Apr. 9, 1889.

Fig. 1.



Witnesses:
Henry Eichling
Henry E. Waite

Inventor
Thos A Macaulay

(No Model.)

4 Sheets—Sheet 2.

T. A. MACAULAY.

AUTOMATIC MUSICAL INSTRUMENT.

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Fig. 3

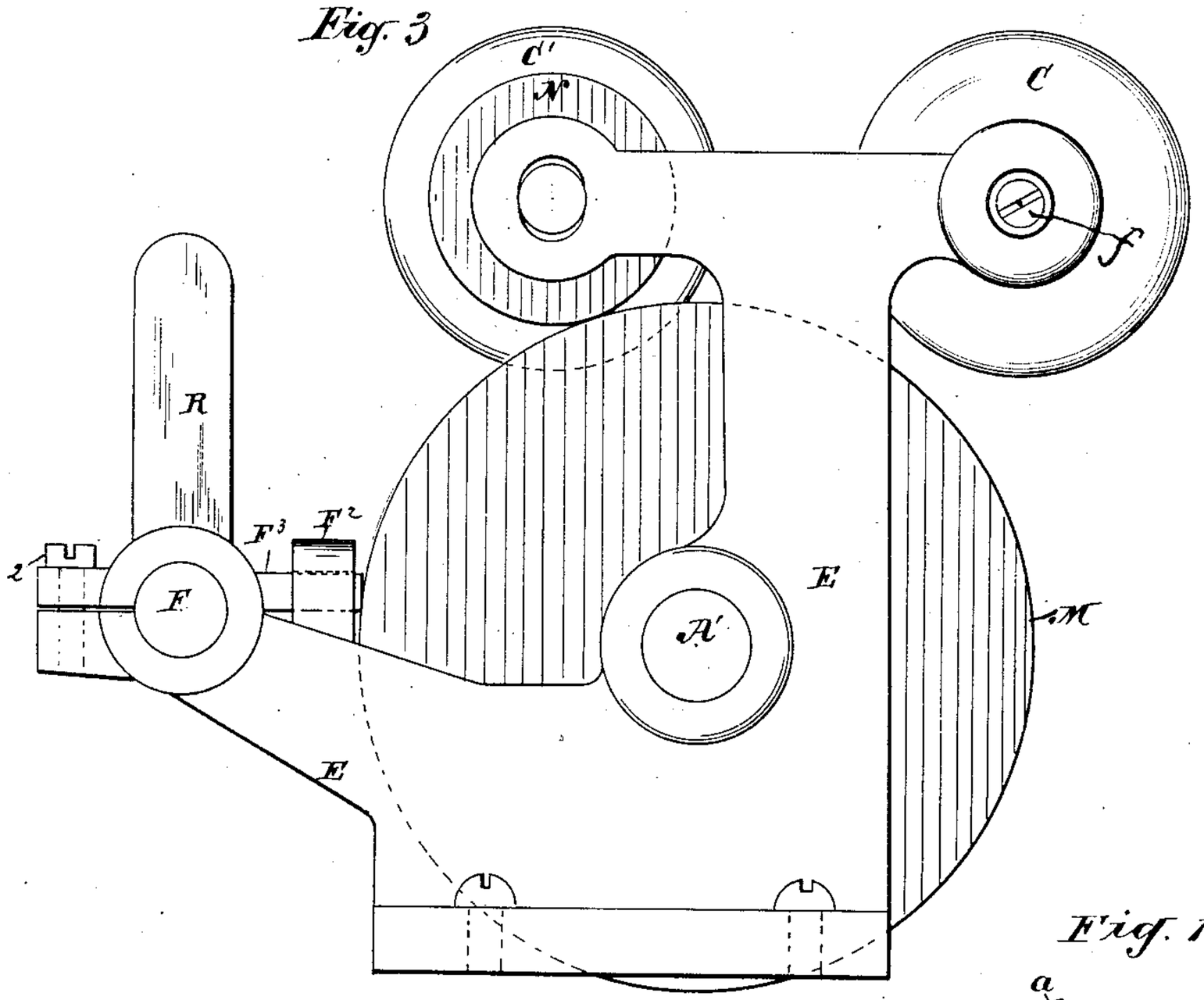

Fig. 10.

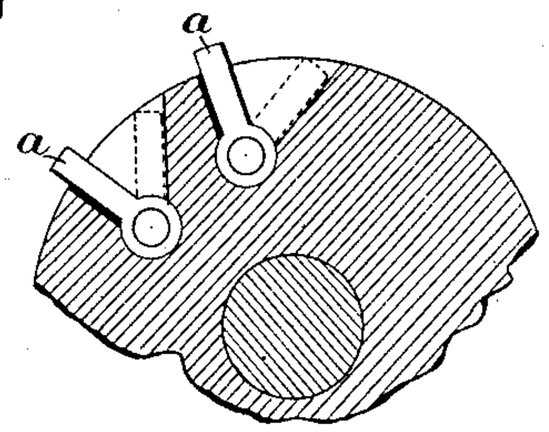

Fig. 2.

Witnesses:
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(No Model.) 4 Sheets—Sheet 3.

T. A. MACAULAY.

AUTOMATIC MUSICAL INSTRUMENT.

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Fig. 9.

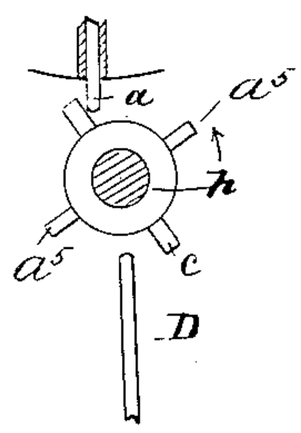
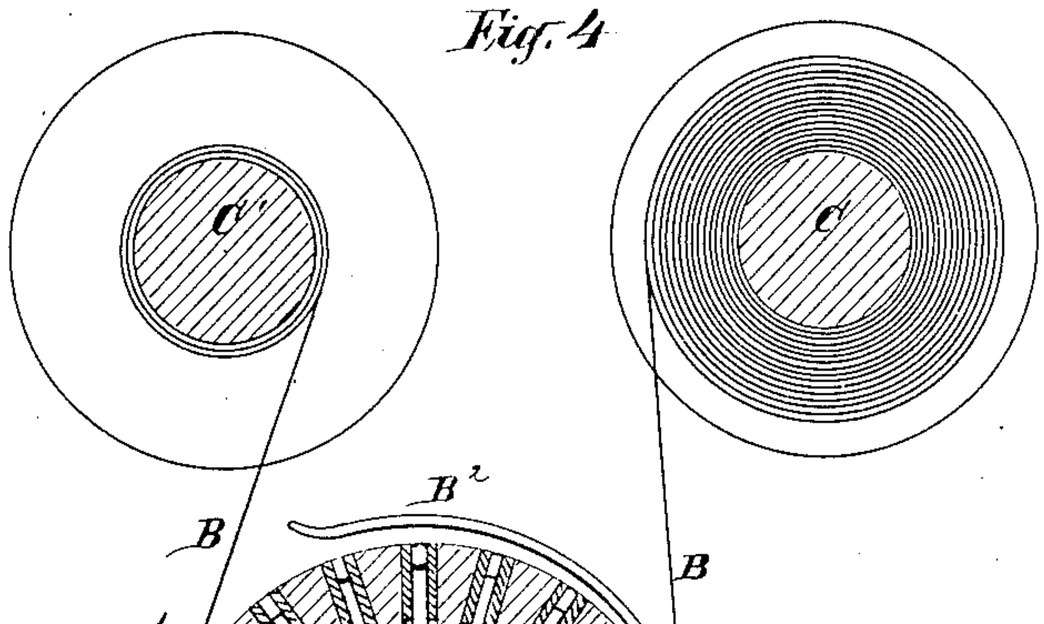


Fig. 4



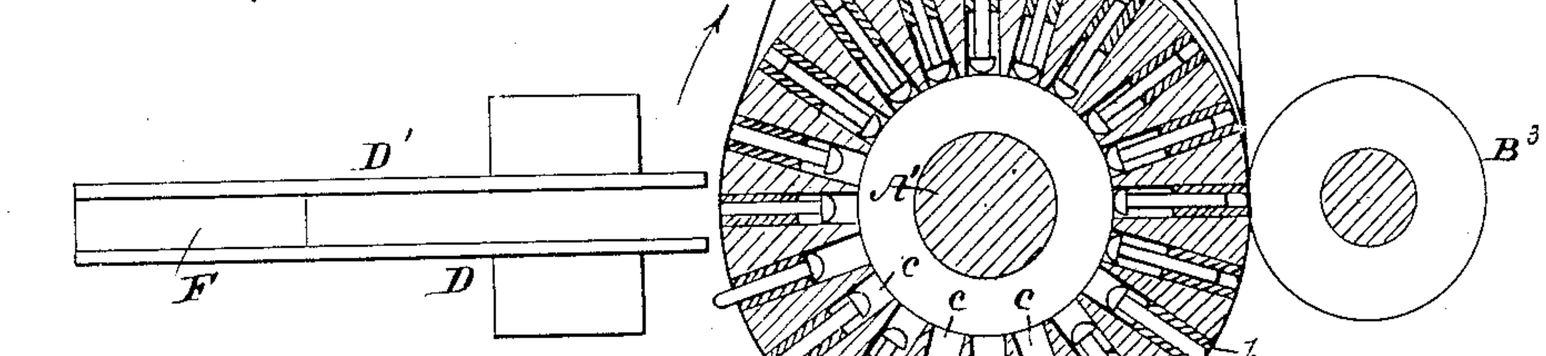
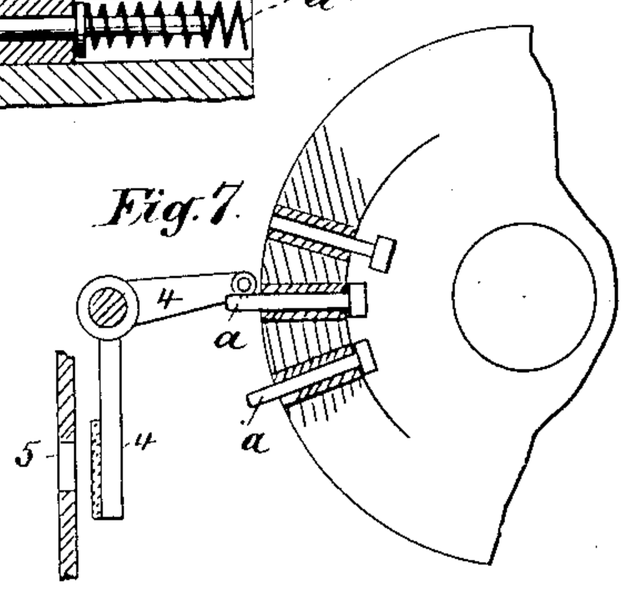


Fig. 8

Fig. 7.



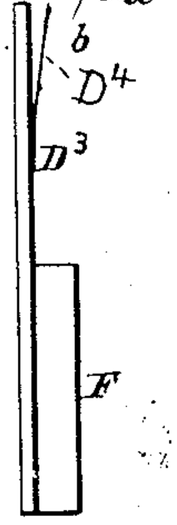
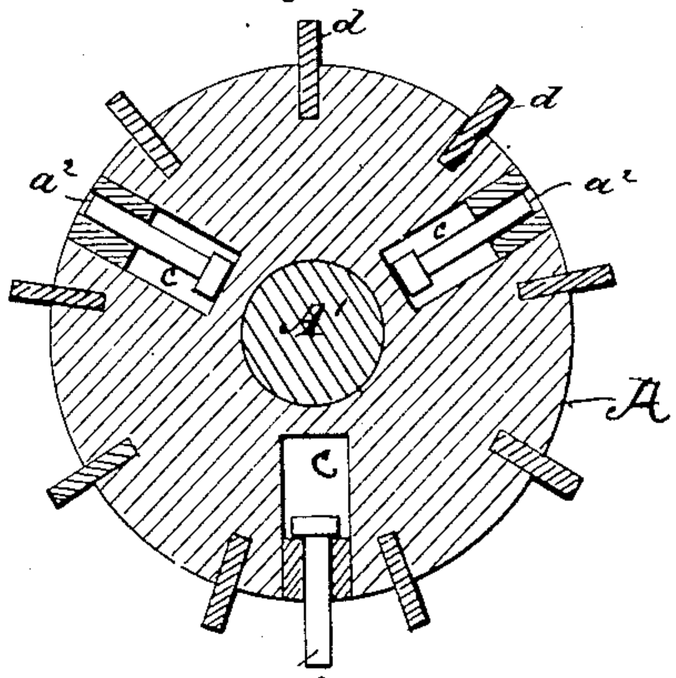


Fig. 5.



Witnesses:
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No Model.)

4 Sheets—Sheet 4.

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AUTOMATIC MUSICAL INSTRUMENT.

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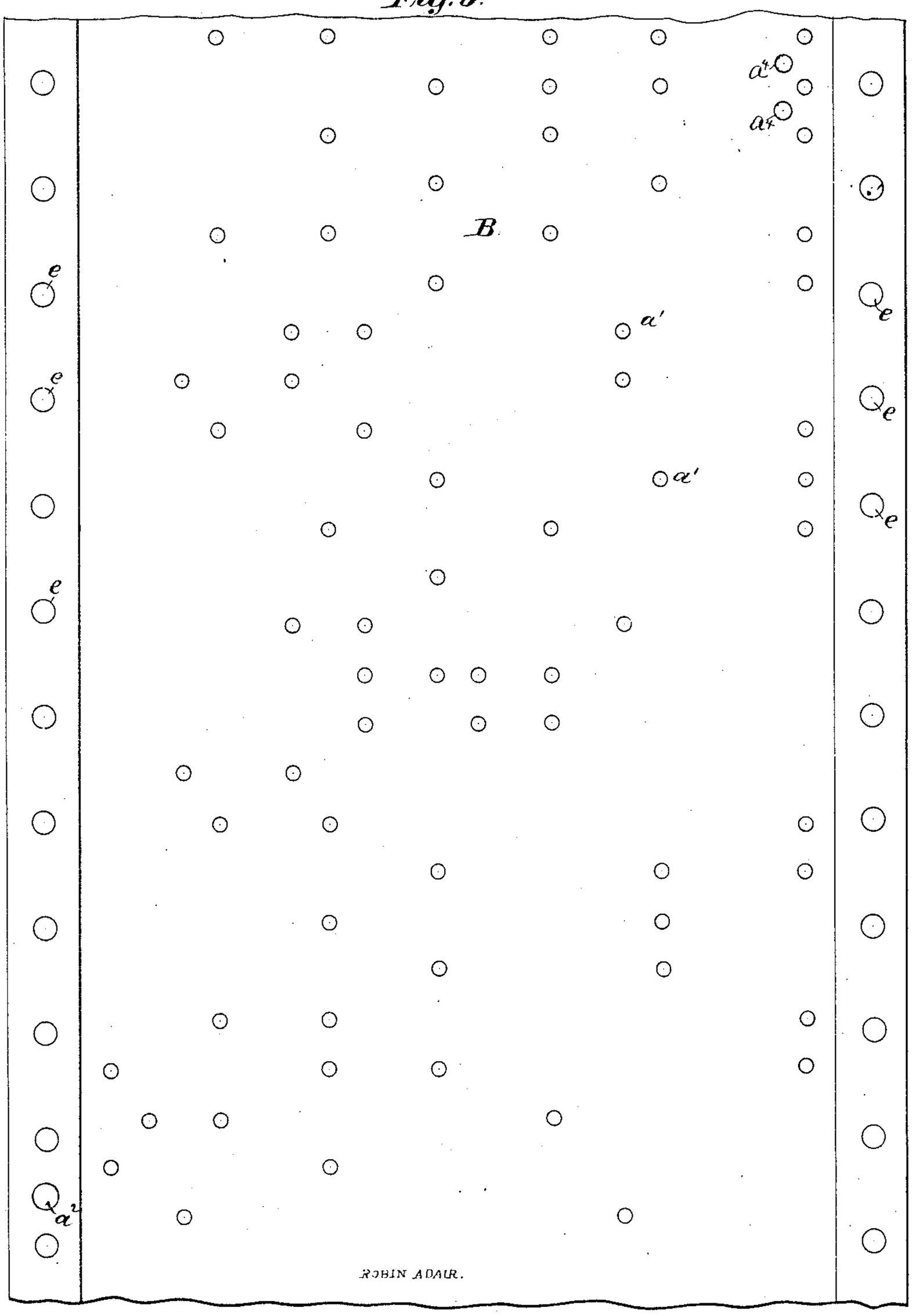
Fig. 6.



ROBIN ADAIR.

Witnesses:
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Henry E Waite

Inventor
Thos A Macaulay

UNITED STATES PATENT OFFICE.

THOMAS A. MACAULAY, OF NEW YORK, N. Y.

AUTOMATIC MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 401,187, dated April 9, 1889.

Application filed July 24, 1886. Serial No. 208,915. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. MACAULAY, of the city, county, and State of New York, have invented certain new and useful Improvements in Automatic Musical Instruments, of which the following, with the accompanying drawings, is a specification.

My invention relates to improvements in self-operating musical instruments in which a perforated sheet controls devices for operating sound-producing devices, hereinafter more fully described, and set forth in the claims.

In the drawings, Figure 1 is a plan view. Fig. 2 is an end view through the line *x x* of Fig. 1. Fig. 3 is an end view through the line Y Y of Fig. 1. Fig. 4 is a view through the line Y^2 Y^2 of Fig. 1. Fig. 5 is a view through the line X^2 X^2 of Fig. 1. Fig. 6 is a view of the perforated sheet. The other figures are detail views and modifications, hereinafter fully described.

A is a cylinder having holes *a* and bushes or guides *b* in its periphery. Its axle A′ is journaled in suitable bearings in a frame, E.

B, Fig. 6, is the perforated music-sheet, of paper or other suitable material, having lines of holes along its edges.

B^3, Fig. 4, is a roller, preferably of rubber, which will force any of the sliding pins *b* back into position should any fail to drop back by gravity after assuming a vertical position, and keep the edges of the holes *e e* from being strained on the pins *d d*.

B^2, Fig. 4, is a guard over the cylinder placed in an inclined position.

C′ is a roller on which the perforated sheet B is wound.

C is a take-up roller.

D, Fig. 1, is a comb of tuned teeth secured to the plate F by screws 3 3 3.

E is the frame of the instrument, in which the cylinder and other working parts are fitted.

F is a comb-plate journaled in split bearings in the frame E and secured by clamping-screws 2 2, and having an operating-arm, R.

F^2 are lugs projecting from the frame E.

F^3 F^3 are arms projecting from the plate F and resting against the lugs F^2, for securing a fixed position to the comb D.

G is a gear-wheel fixed to the shaft G^2.

H is a gear-wheel fixed to the axle A′ of the cylinder A and meshing with the gear G.

I is a gear-wheel journaled on the stud J and meshing with the gear H.

K is a wheel fixed to the wheel I and journaled on the stud J.

K^2 is a spiral journaled in suitable bearings and meshing with the wheel K.

L is a fan-wheel.

M is a wheel secured to the opposite end of the axle of the cylinder A.

N is a wheel fixed to the axle of the roller C′.

O is a lever connected with the shaft G^2, for winding the spring-power G^3.

P is a lever operated by a pin in the cylinder for stopping the fan-wheel and the driving-power.

P^5 is a stud on which the lever P is journaled.

P^3 is a downward extension of the lever P.

P^4 is an upward extension of the lever P.

P^7 is a pin fixed to the lower end of the lever P, and provided with a spiral spring of sufficient strength to move the lever P and a clip-piece, P^6, to insure an easy action in stopping the instrument.

R is an upward extension of the plate F.

a a^2 a^4, Figs. 1 and 4, are pins made with heads on one end in the form of rivets.

b b, Figs. 1 and 4, are bushings driven or screwed into holes *c c* in the cylinder A. They are of equal length, and when in position are even with the face of the cylinder, the inner ends serving as a stop to the pin-heads when they fall through the holes in the sheet.

d d, Figs. 1 and 5, are registering pins fixed in each end of the cylinder A, and project a short distance from its face. They are equally distant from each other circumferentially.

e e, Fig. 6, are registering holes in the sides of the paper sheet, of the same equal distance apart as the pins *d d* in the cylinder A.

f is a bolt having a shoulder, *f′*, and a spiral spring inclosed in a hub in the frame E. On this bolt *f* is journaled the roller C. The other end of the roller is journaled on the bolt f^2, Fig. 1. The holes *c c*, Fig. 1, are deeper than the length of the pins *a a* and slightly larger than the pin-heads, so as to permit a free movement of the pin-heads in

the space between the inner ends of the bush and the lower end of the hole *c*, into the cylinder. The pins are also sufficiently loose in the bushes to insure a free movement by gravity alone.

The operation is as follows: The cylinder A is caused to rotate by any suitable power, preferably clock-work such as is used in music-boxes, as partly shown in the train of gearing to the right of Fig. 1. The plate F is thrown out of position downward by the arm R, so as to leave space enough between the cylinder A and the comb D. The sheet of perforated paper is passed from the roller C around the cylinder A, the registering holes *e e* in the paper sheet B being passed over the registering pins *d d* in the cylinder A, and its end secured in any suitable way to the roller C′. The wheel N on the roller C′ is rotated by frictional contact with the wheel M, which is fixed to the cylinder A, so that as fast as the sheet B is delivered from the cylinder A it is taken up by the roller C′. The holes *a′ a′* of the sheet B, Fig. 6, are in fixed relation to the holes *e e e* in the paper sheet, and the fixed pins *d d* are in the same fixed relation to the sliding pins *a a* in the cylinder A as the holes *e e* and *a′ a′* in the paper sheet B. It therefore follows that every hole *a′* in the paper sheet B, Fig. 6, must come opposite a hole, *a* or a^4, in the cylinder A, and that as many pins will fall by their gravity through holes in the paper sheet as there are holes in the sheet opposite a pin in the cylinder, projecting a short distance from the cylinder-face, and will remain in that position till they come in contact with and cause the comb-tongues to vibrate in the order predetermined by the position of the holes *a′ a′* in the paper sheet B. When the pins reach a vertical position in the cylinder A, they fall back by their gravity on their heads in the holes *c c*, as shown in Fig. 8, their other ends being slightly below the surface of the cylinder A ready to fall through holes in the sheet again and vibrate the comb-tongues, as before, and produce "a succession of sweet sounds." When the perforated sheet has reached the end of the music-holes *a′ a′*, a hole, a^2, in the sheet B between the registering holes *e e e* comes opposite a pin, a^2, Fig. 5, in the cylinder A and falls through in due time, coming in contact with the clip-piece P^6, connected to the lever P. This raises up that end of the lever P, bringing its opposite end, P^5, in contact with the fan-wheel K, and thus stops the motion of the apparatus. The paper sheet may then be rewound and removed and another sheet be substituted for it, as before described.

If it is desired to stop the instrument before finishing a piece, by pressing forward the extension P^4 of the lever the end P^3 will be brought in contact with the fan-wheel L and so stop its motion.

It will be noticed that the guard B^2 has an inclined position toward the cylinder at one of its sides. This inclination serves also to force back into their places the pins *a* should any of them project from the face of the cylinder after assuming a vertical position, as well as when a slight spring is used, as shown in Fig. 8.

I have shown my invention as principally applied to vibrating tongues of a comb such as are used in music-boxes; but it can readily be applied to wind-instruments, as shown in Fig. 7, where the pins come in contact with the intermediate lever, 4, before it closes the aperture 5, which leads to a reed; or the pins may trip a hammer and the hammer strike strings or wires, as in a piano, as commonly done in instruments of that kind.

Instead of the pins being operated by gravity alone to cause them to pass through the holes in the paper sheet, they may have slight springs to assist, as shown in Fig. 8, or otherwise applied in any suitable manner. Instead of operating the comb-teeth directly by the pins, a spur-wheel, *h*, as shown in Fig. 9, may be used, the spurs *c c* coming in contact with the comb-teeth or other sounding device instead of the pins direct. The advantage of the spur-wheel *h* is that being mounted on a shaft in close proximity to the comb-tooth and the spurs being rigid their action is more certain and positive.

Instead of sliding pins, as shown in Fig. 4, pins may be pivoted, as shown in Fig. 10. Instead of having the registering pins *d d* at each end of the cylinder, as shown, a single row may be placed in the center of the cylinder and the registering holes *e* the same in the sheet B. Such an arrangement permits a narrower strip of paper sheet to be used.

The pins *a* are shown as round in form; but they may be of any other desirable form and the bushings made to suit such different form, and the holes in the paper may be made other than round to suit the form of the pins.

As shown in Fig. 4, the two comb-teeth D D′ are placed in a horizontal position in the same plane at such a distance apart that the sound of two tuned alike shall be of greater duration than the sound of one, owing to the time of commencing to vibrate.

If it be desired to produce a sound of still greater duration, a line of comb-teeth may be placed at an angle (as D^5, Fig. 4) to the horizontal line D D′, as shown, and a different set of pins in the cylinder, as a^4 a^4, may be used to operate the vertical line of comb-teeth, and a set of holes in the paper sheet to correspond to the pins a^4 a^4. In this way as many as at least four teeth having the same sound may be successively set in vibration and a sound of considerable duration be produced. If deemed desirable, a hole, such as a^2, may be provided on the opposite side of the sheet B for operating a lever to tilt the plate F instead of having to do it by hand.

The music-sheet has its edges folded over where the lines of registering holes *e e* come, to insure strength, and, if deemed desirable,

a strip of cloth may be placed between said folds; or the sheet edges may be bound with strengthening material; or metallic or other eyelets in the registering holes *e e* may be used to resist wear.

The frame E is made of two parts and bolted to a base-plate.

Having described my invention I claim—

1. In an automatic musical instrument controlled by a perforated sheet, a cylinder having movable pins, said pins being held in operative position by gravity alone to operate a sounding device, for the purpose specified.

2. In an automatic musical instrument controlled by a perforated sheet, a cylinder having movable pins, said pins being held in operative position by gravity alone, in combination with means, as *h*, to operate sounding devices, for the purpose specified.

3. In an automatic musical instrument, in combination, the cylinder having movable pins controlled by a perforated sheet and a spur-wheel operated by said pins, for the purpose specified.

4. In an automatic musical instrument, in combination, the cylinder having pins controlled by a perforated sheet and a device having multiple projections adapted to be operated by said pins, for the purpose specified.

5. In combination, the cylinder having pins and the spur-wheels C, operated by said pins, for the purpose specified.

6. In combination, the cylinder having pins and a device having multiple projections adapted to be operated by said pins, for the purpose specified.

7. In an automatic musical instrument, a movable perforated sheet, suitable devices for moving said sheet, and a device having multiple projections operated by devices controlled by said sheet, said multiple projections adapted to operate sounding devices.

8. In an automatic musical instrument controlled by a perforated sheet, a cylinder having holes, adjustable bushes fitted into said holes and provided with pins adapted to move outward and inward in said bushes, whereby the extent of movement of the pins is varied, for the purpose specified.

9. In an automatic musical instrument, a cylinder having holes, bushes open at both ends fitted into said holes, and pins having heads or collars loosely fitted in said bushes, for the purpose specified.

10. In an automatic musical instrument controlled by a perforated sheet, a cylinder having holes, bushes fitted into said holes and provided with pins adapted to move outward and inward in the respective bushes, and having heads or collars playing between the bushes and the inner ends of the holes of the cylinder to limit the movement of the pins, for the purpose specified.

11. In an automatic musical instrument, in combination with a cylinder having movable pins controlled by a perforated sheet, a spur-wheel operated by said pins and a sounding device operated by said spur-wheel, for the purpose specified.

12. In an automatic musical instrument, the combination of movable pins in a cylinder controlled by a perforated sheet, a sounding device, as D, and an intermediate rotary device for operating said sounding device.

13. In an automatic musical instrument, the combination of movable pins in a cylinder controlled by a perforated sheet, a sounding device, and an intermediate device for operating said sounding device.

14. In an automatic musical instrument, the combination of a cylinder having pins, a sounding device, and an intermediate rotary device, as *h*, having projections for operating said sounding device, for the purpose specified.

15. In an automatic musical instrument, the combination of a cylinder having pins, a sounding device, and an intermediate device, as *h*, having projections, as a^5, for operating said sounding device, for the purpose specified.

16. In an automatic musical instrument, the following elements in combination: a sounding device, as D, a spur-wheel for operating said sounding device, and an automatic device, as A, provided with means to operate said spur-wheel, for the purpose specified.

17. In an automatic musical instrument, the following elements in combination: a sounding device, a rotary device having means to operate said sounding device, and an automatic rotating device, as A, provided with projections adapted to operate said rotary device, for the purpose specified.

18. In an automatic musical instrument, the following elements in combination: a sounding device, as D, a rotary device, as *h*, having projections, as a^5, adapted to operate said sounding device, and a rotary device having projections for operating said rotary device *h*, for the purpose specified.

19. In an automatic musical instrument, a movable pin-cylinder having lines of holes arranged in quincuncial order, for the purpose specified.

20. In an automatic musical instrument, a movable pin-cylinder having lines of holes arranged in quincuncial order and a perforated sheet adapted for use with said cylinder, for the purpose specified.

21. In an automatic musical instrument, the combination of the clip P^6, the spring, the lever P^7, and the operating-pin, for the purpose specified.

22. In an automatic musical instrument, the combination of a movable pin-cylinder provided with a stop-pin, a perforated sheet provided with holes registering with said stop-pin for releasing the same, and means, as a lever, for stopping the instrument thereby.

23. In an automatic musical instrument, in combination, a perforated sheet having holes, a cylinder having movable pins controlled by

said sheet and a lever or equivalent device operated by said pins, and a fan-wheel or other similar device controlled by said lever to stop the instrument, for the purpose specified.

24. In an automatic musical instrument, a perforated sheet having a line of holes, as *e*, adapted to engage feeding devices, a hole or holes, as a^2, intermediate between said holes, and one or more stop-pins, the feed-engaging holes being adapted to permit the passage over them of the said pin or pins to stop the instrument.

25. In an automatic musical instrument, the combination of a cylinder provided with fixed registering pins, one or more movable stop-pins, and a perforated sheet provided with sets of perforations adapted to the several sets of pins, for the purpose specified.

26. A perforated sheet for automatic musical instruments having one or more holes registering with a stop device and adapted to release the same, whereby the instrument is caused to stop.

27. In an automatic musical instrument, the combination of a perforated flexible sheet, a cylinder having fixed pins registering with said perforations, a wheel, as M, deriving its movement from said cylinder, and a take-up roller, as C, for taking up the flexible sheet.

28. In an automatic musical instrument, in combination with a pin-cylinder, a comb-plate movable away from its operative position, for the purpose specified.

29. In an automatic musical instrument, the combination of the arm R with the comb-plate F, the arm F^8, and the lug F^2, for the purpose specified.

30. In an automatic musical instrument, the combination of the comb-plate F, the arm F^3, and the lug F^2, for the purpose specified.

31. In an automatic musical instrument, in combination with a pin-cylinder two or more comb-plates placed one over the other and provided with corresponding teeth tuned in unison, whereby two or more sounds of the same pitch are produced in succession to represent one note and prolong the same.

32. In an automatic musical instrument, a comb-plate fixed in bearings and adapted to be brought out of and into operative position, for the purpose specified.

33. In an automatic musical instrument, a cylinder having movable pins, a perforated sheet, two or more rows of sounding devices placed one above the other, and devices to operate said sounding devices controlled by said perforated sheet, for the purpose specified.

34. In an automatic musical instrument, a perforated sheet, a cylinder having pins adapted to engage in said perforations, and a roller pressing said sheet against said cylinder, for the purpose specified.

35. In an automatic musical instrument, a cylinder having pins and a guard placed over said cylinder, for the purpose specified.

36. In an automatic musical instrument, a pin-cylinder having a guard fixed in an inclined position over said cylinder, for the purpose specified.

37. A perforated sheet for automatic musical instruments having two lines of equidistant holes and a series of lines of holes unequally distant located between said lines of equidistant holes, for the purpose specified.

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