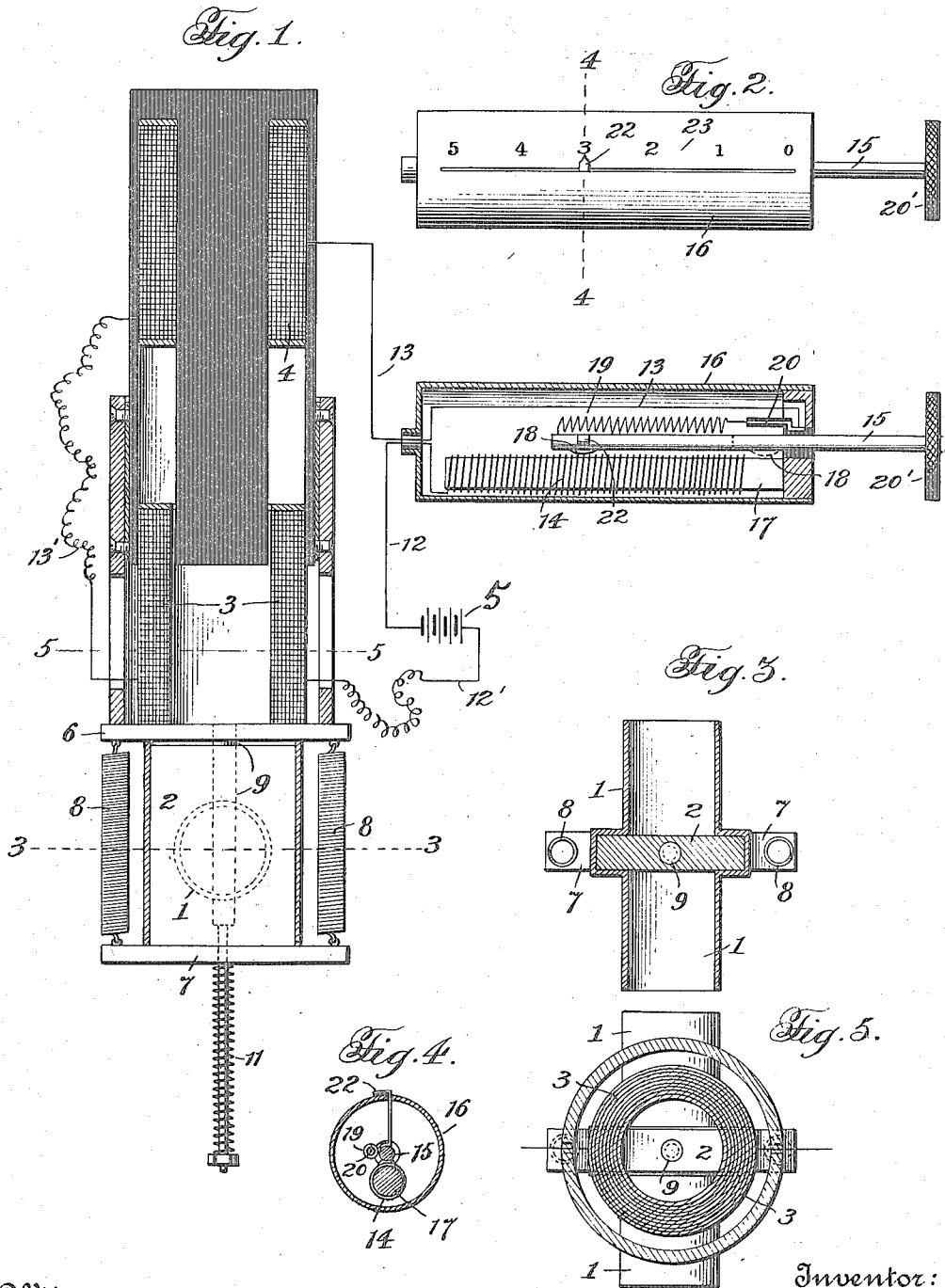


L. A. WHITE.
MAGNETIC VALVE.
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1,271,108.

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Witness:

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LOUIS ALFRED WHITE, OF BROOKLYN, NEW YORK.

MAGNETIC VALVE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LOUIS A. WHITE, a citizen of the United States, residing at Brooklyn, in the borough of Brooklyn and State of New York, have invented certain new and useful Improvements in Magnetic Valves, of which the following is a specification, reference being had therein to the accompanying drawing.

The invention relates to improvements in magnetic valves, capable of a wide variety of uses, but particularly adapted for controlling the inlet to the air motor of a player piano.

It is an object of the invention to provide a means for controlling a valve to vary the quantity of air admitted to an air motor, which is under the instant control of the operator, permitting the valve to be actuated so as to completely open the air passage to the motor, or restrict the inlet opening to limit the amount of air introduced thereto to any desired quantity, it being apparent that the motor will operate rapidly when a large volume of air is allowed to pass thereto and the action thereof will be comparatively slow when the volume of air is small.

In carrying out my invention, the preferred embodiment thereof consists of a valve located in the motor supply pipe and adapted to be moved in one direction upon the energizing of a suitable electromagnet, acting in opposition to a resilient member that normally holds the valve in a closed position. As the valve is raised upon the energizing of the magnet the resilient member acting in opposition thereto is flexed, and the valve will be raised to a position until the tension of the resilient member equals the drawing action of the magnet. To vary the distance the valve is to be opened, the current admitted to the magnet passes through a resistance coil forming with a movable contact member a controller so that if it is desirable to admit only a small volume of air to the motor the movable contact engages the resistance coil at a point near its end, which will cause the current to pass through the resistance coil and when introduced to the magnet be relatively weak and lift the valve only a short distance against the action of its springs. However, if the valve

is to be opened entirely the movable contact member is shifted so that the current passes through only a very small portion of the resistance coil and is introduced to the magnet in a powerful condition thereby completely raising the valve, as the drawing action of the magnet at this time is considerably greater than the tension of the spring acting in opposition thereto.

My invention also comprehends the use of an indicating mechanism which is preferably in the nature of a dial over which a suitable pointer carried by the slidable contact member travels so that the user after shifting the contact can immediately observe the tempo, of the piano, that it, instantly note the change of speed at which the air motor will travel, due to the position of the controlling valve for the air pipe.

With these and other objects in view the invention consists in the combination and arrangement of parts as will be more fully hereinafter described and pointed out in the appended claims.

In the drawings,

Figure 1 illustrates my improvements in section certain parts being shown in elevation;

Fig. 2 is an elevation of the resistance coil casing and switch;

Fig. 3 is a sectional view on line 3—3 Fig. 1;

Fig. 4 is a sectional view on line 4—4 of Fig. 2; and

Fig. 5 is a sectional view on line 5—5 of Fig. 1.

Referring now more particularly to the drawings, wherein like numerals indicate corresponding parts, the numeral 1 designates an air inlet pipe communicating with an air motor of any convenient type, (not shown) connected with the usual operating mechanism of an automatic piano of any desired construction. Disposed within the pipe 1 is a reciprocating valve 2 connected at its upper end with the coil 3 of an electromagnet. The magnet may be of any desired construction but it is preferably one in which there is the usual exciting coil 4 to which the conducting wires from the battery 5 or any other source of electrical energy connect, while the armature is also com-

posed of a winding in circuit with the batteries so that when the circuit is closed the action of the magnet is very quick and effective, to the end that the valve is properly actuated, the conducting wires 12'—13' leading to the core 3, the conducting wires 13—13' being connected with the coil 4. The valve 2 is connected to the movable coil or armature 3 of the magnet in any suitable manner preferably to a bar 6 secured to the base of the coil 3, while the outer ends of this bar have attached thereto upon each side coil springs 8 secured to a support 7 underlying the pipe 1 these springs normally holding the valve closed and acting in opposition to the magnet when the same is energized. The cross bar 6 also has a depending rod 9 passing through a bore in the valve 2 and extending below the member 7, this depending portion of the rod being surrounded by a suitable coil spring 11. The air inlet pipe is of any construction and it will of course be understood that while I have described the device as being applied to a player piano the valve and the regulating mechanism therefor to be presently set forth may be used in a wide variety of arts, or in fact wherever a valve of this character is useful.

When the valve is raised upon the passing of the current to the magnet from the source of energy 5 through the conducting wires 12—12' 13—13', resistance coil 14 and switch 15 to the exciting core and armature of the magnet, the coil 3 is raised in opposition to the springs 8 and 11 thereby raising the valve 2 to open the air passage and permitting the entrance of air to the motor. The specific construction of the resistance coil 14 and switch 15 which will be termed the controlling mechanism for the valve will hereafter be more fully described.

The arrangement of the resilient springs 8 and 11 as illustrated is very efficient, but instead of flexing and compressing the springs upon the energizing of the magnet, the structure may be such that these springs are all compressed when the valve is moved, and obviously such a structure as this will be within the spirit of the invention.

In order that the extent that the valve is to be opened may be varied or regulated a resistance coil 14 is disposed within a suitable casing 16 surrounding the same and located remotely from the valve, the resistance coil being in communication with the source of electrical energy 5 by means of the conducting wire 12. The coil 14 is of any suitable resistance material and surrounds a support or core 17 disposed within the casing, and extends substantially over the entire length of the core and is free at its outer end. To close a circuit between the magnet and the source of energy a slidable switch 15 is employed consisting of a rela-

tively long plunger rod passing through an opening in one end of the casing and carrying a suitable contact point 18 near one end which engages and rides over the resistance coil 14 during the reciprocation or movement of the plunger rod. The plunger rod is shifted by means of the knob 20' which is attached to the free end of the rod and is preferably composed of rubber or other insulating material. The regulator is preferably portable whereby the operator of the valve can be located at different places and yet instantly open the valve the desired extent upon the shifting of the contact 15.

The switch 15 is normally held in a position as disclosed in Fig. 1, that is out of contact with the resistance coil and rests against one end of the casing, due to the tension of the spring 19 that is fastened at one end to the sliding switch, and at its opposite end to a metallic plate 20 disposed inwardly from a wall of the casing and having a connection with the conducting wire 13 leading to the magnet core 4. It will therefore be seen that when the contact 18 engages the resistance coil current passes from the source of energy through the conductors 12, that portion of the resistance coil in advance of the contact 18 and thence through the spring 19, plate 20 and wires 13—13' 12' so as to establish a closed circuit which will cause the energizing of the exciting coils 3—4 of the magnet attracting the core 3 that is attached to the valve and raising the valve in opposition to the tension of the springs 8 and 11 acting thereagainst thus permitting a predetermined amount of air to be admitted through the air supply pipe. The volume of air admitted through the supply pipe is regulated by the position which the switch member 15 occupies it being apparent that if the switch is contacting with the resistance coil near its free end the current passing from the source of energy 5 will travel through the conducting wire 12 and substantially the entire length of the resistance coil and will therefore be comparatively weak when it passes to the magnet coils 3—4, only raising the valve a short distance due to the fact that after a slight flexing of the springs 8 and 11 the tension of these springs will overcome or counterbalance the drawing power of the exciting coil 4 of the magnet. The switch must engage the resistance coil when the valve is to be opened as in its normal position the valve is closed, the same being lowered by the action of the springs 8 and 11. If however, the switch is shifted so that the contact member 18 engages the resistance coil near one end the current passing from the source of energy will merely travel through a small portion of the resistance coil and will therefore be powerful when entering the magnet coils, the exciting coil of

the magnet at this time overcoming the tension of the springs 8 and 11 and completely raising the valve to permit a full supply of air to pass through the supply pipe 1.

It is desirable that the structure be such that the position of the valve can be readily determined and to this end I mount upon the lower portion of the switch 15 a pointer 22 which is of substantially an angular construction having a portion extending through a slot in the casing surrounding the resistance coil and offset after its passage through the slot to travel over an indicating dial 23 mounted upon the exterior wall of the casing and bearing graduation marks which will upon observation accurately show the position of the valve. This structure when applied to a player piano will indicate to the operator the speed of the air motor and designate the (tempo) of the piano. This form of indicator is very desirable in view of the fact that it is simple and inexpensive, but any suitable type may be used to perform the function sought.

The valve and its controlling mechanisms is particularly adapted for player pianos, but the device is capable of a number of uses as will appear to persons skilled in the various arts to which the invention relates and is suitable for service in opening or closing valves of any type.

Having thus described the various parts of the device, the operation may be briefly stated as follows:

When it is desired to completely open the air passage 1 the slidable switch is shifted so that the contact 18 thereof engages the resistance coil near one end, causing the current from the source of energy 5 to pass through the conductor 12, and the relatively small portion of the resistance coil 14 and thence through the spring 19, metallic plate 20, and conducting wire 13—13'—12' to the magnetic coils of the magnet thereby energizing the coils and attracting the armature core 3 to open the valve. The current passing to the magnet at this time is very powerful and overcomes the tension of the springs 8 and 11 acting in opposition thereto so that the valve is completely open and a large volume of air is permitted to flow through the pipe 1. The position of the valve at this time is designated by the pointer carried by the movable plunger so that the operator can instantly observe the position of the valve. If it is only desired to open the valve a short distance the movable contact is shifted by grasping the handle 20' and rests in a position whereby the contact point 18 engages the resistance coil near its free end, causing the current to pass from the source of energy through substantially the entire resistance coil and thence to the two coils of the magnet. The current

at this time will be comparatively weak so that the drawing action of the coils will only slightly overcome the tension of the springs 8 and 11 and will raise the valve 2 a short predetermined distance until the springs 8 and 11 have been flexed, at which time the tension of these springs will counterbalance the drawing power of the magnet and retain the valve in its predetermined position. It will of course be understood that the contact can be shifted so as to engage various portions of the resistance coil which will vary the position of the valve and the position of the valve will at all times be accurately designated by the indicator carried by the movable switch traversing the dial upon the casing.

While I have herein disclosed one embodiment of the invention, it will be understood that many changes and substitution of parts, and combinations thereof may be made without departing from the spirit of the appended claims.

What I claim as new is:

1. The combination with a valve, of a magnet for moving the same, a source of electrical energy connected with said magnet, controlling means including a resistance coil, and a movable contact adapted to be brought in engagement therewith for regulating the current passing to the magnet for allowing the valve to be moved various distances, and indicating means associated with said controlling means for designating the position of the valve.
2. The combination with a valve, of an electromagnet for moving the same in one direction, means acting in opposition to the magnet for normally holding the valve in a given position, a source of electrical energy connected with said magnet, and controlling means for regulating the current passing to the magnet for moving the valve various distances including a resistance coil and a movable contact member in engagement therewith, and capable of contacting with different portions of said coil, and indicating means associated with the controller for designating the position of the valve.
3. The combination with a valve, of an electromagnet for moving the same, a source of electrical energy in connection with the magnet, means for regulating the strength of the current passing to the magnet to permit the valve to be moved various distances, and means carried by said regulating means for indicating the extent of movement of the valve.
4. The combination with a valve, of an electromagnet for moving the same, a source of electrical energy in connection with the magnet, means for regulating the strength of the current passing to the magnet to permit the valve to be moved various distances, and means carried by said regulating means

for indicating the extent of movement of the valve, said last mentioned means comprising a movable pointer.

5 The combination with a valve, of an
electromagnet for moving the same, a source
of electrical energy in connection with said
magnet, means for varying the strength of
the current traveling to the magnet to cor-
respondingly regulate the movement of the
10 valve comprising a resistance element and a

movable contact cooperating therewith, and
means carried by said movable contact for
indicating the extent of movement of said
valve.

In testimony whereof I hereunto affix my 15
signature in the presence of two witnesses.

LOUIS ALFRED WHITE.

Witnesses:

HENRY L. O'BREIN,
MAY BARKER.