No. 895,925. PATENTED AUG. 11, 1908.

W. R. WHITEHORNE.

ELECTRIC ORGAN.

APPLICATION FILED SEPT. 7, 1906.

3 SHEETS—SHEET 1.

Fig. 1

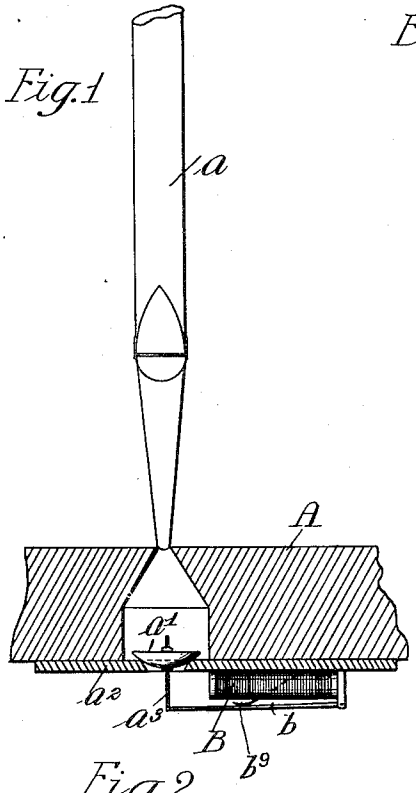


Fig. 2.

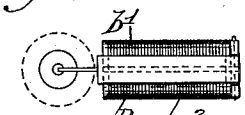


Fig. 5

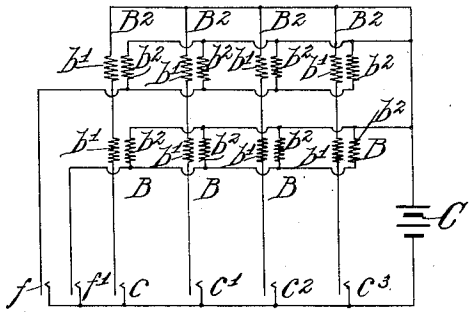


Fig. 6.

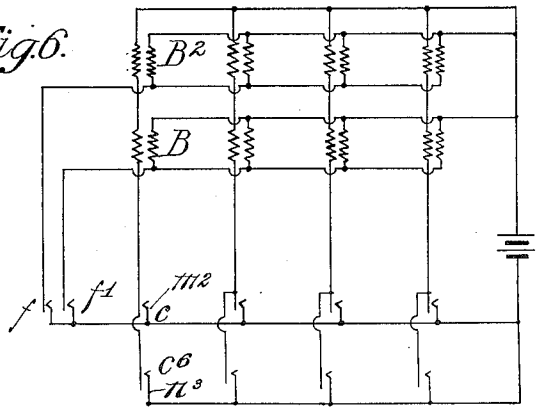


Fig. 3.

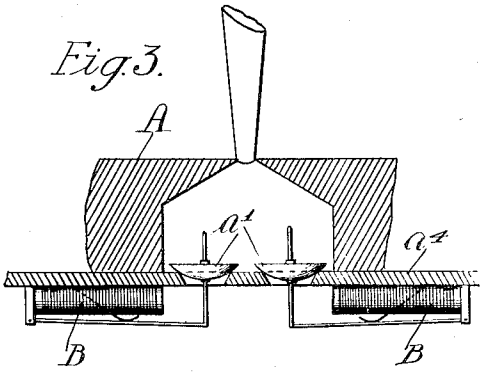
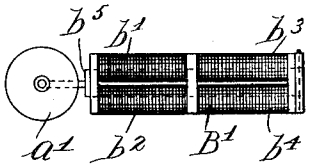


Fig. 4.



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3 SHEETS—SHEET 2.

Fig. 13.

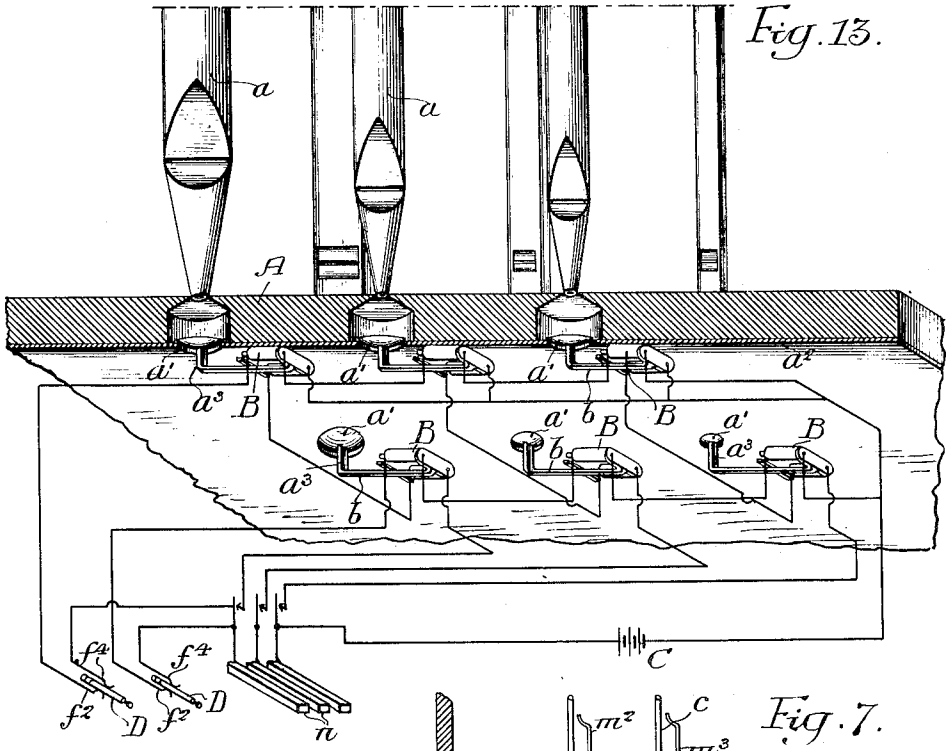


Fig. 7.

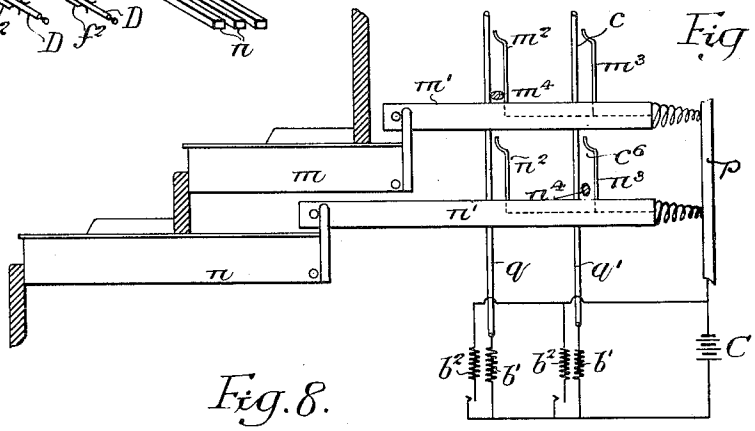
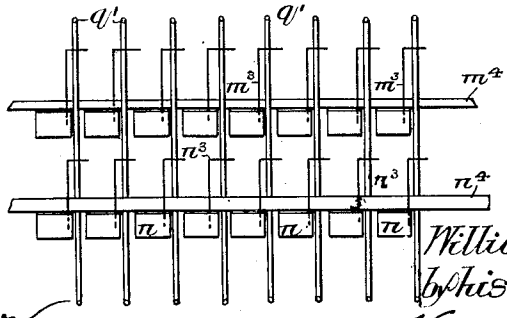


Fig. 8.



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3 SHEETS—SHEET 3.

Fig. 9.

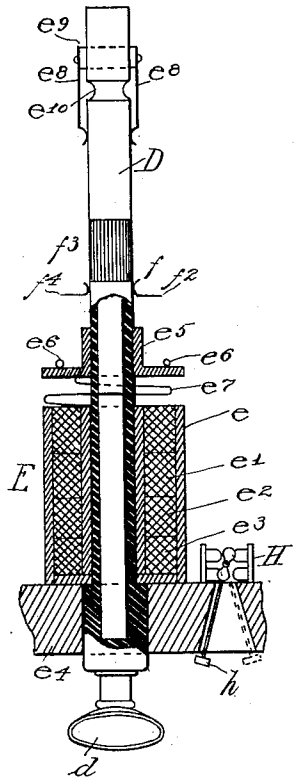


Fig. 11.

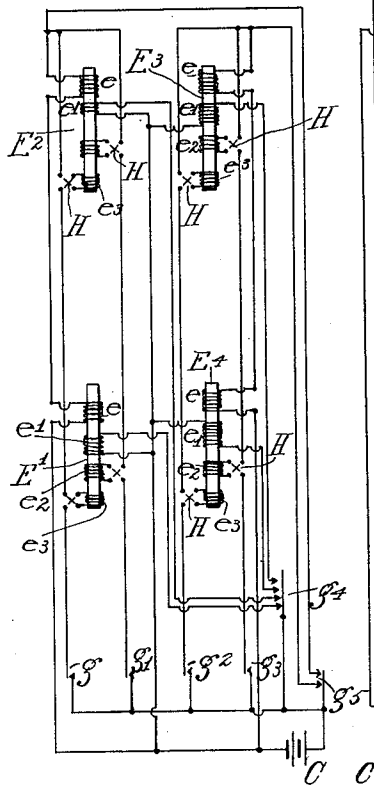


Fig. 12.

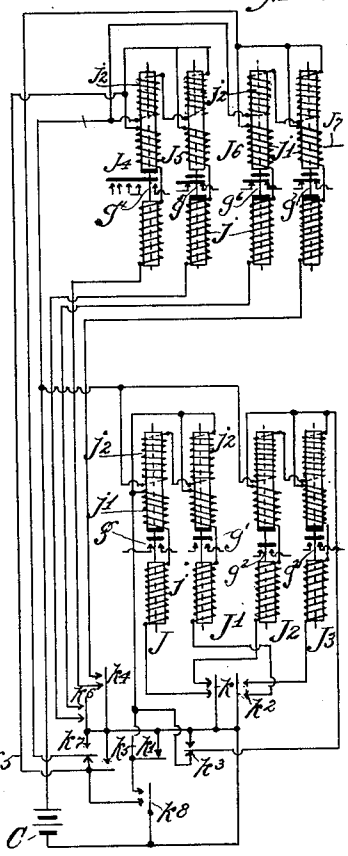
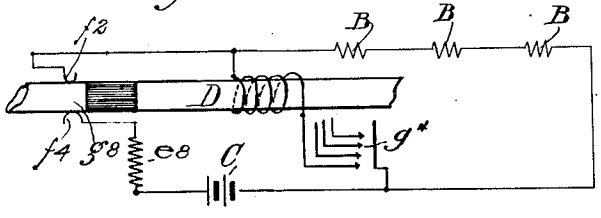


Fig. 10.



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UNITED STATES PATENT OFFICE.

WILLIAM R. WHITEHORNE, OF BETHLEHEM, PENNSYLVANIA.

ELECTRIC ORGAN.

No. 895,925. Specification of Letters Patent. Patented Aug. 11, 1908.

Application filed September 7, 1906. Serial No. 333,590.

To all whom it may concern:

Be it known that I, WILLIAM R. WHITEHORNE, a citizen of the United States, residing in Bethlehem, Pennsylvania, have invented certain Improvements in Electric Organs, of which the following is a specification.

One object of my invention is to provide a positive and direct acting device for electrically controlling the sounding of each organ pipe or set of pipes of an electrically controlled organ, as well as to reduce the number of parts and connections required to actuate and control the various devices constituting the mechanism of the organ, particularly of that type having two or more manuals and a relatively large number of stops and combinations.

I further desire to provide relatively simple electrical means for throwing into or out of operative condition any desired number of sets of pipes, for controlling the coupling of two or more manuals, for duplicating pipes and borrowing stops, as well as performing the other operations required to control an organ.

These and other advantageous objects, as will later appear, I attain as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a vertical section illustrating my improved means for controlling the admission of air to an organ pipe; Fig. 2, is an inverted plan view of the valve illustrated in Fig. 1; Fig. 3, is a vertical section of a special form of air controlling means for a pipe; Fig. 4, is a plan of a special form of magnet for accomplishing the same end as that attained by the two magnets shown in Fig. 3; Fig. 5, is a diagram of the connections for controlling the sounding of a pipe or set of pipes; there being in the case illustrated controlling mechanism for eight pipes, which consists of two stops and four keys; Fig. 6, is a diagram similar to Fig. 5, but illustrating the means for coupling the keys of two manuals; Fig. 7, is a vertical section illustrating the electrical and mechanical devices for coupling the keys of two manuals; Fig. 8, is an elevation, to some extent diagrammatic, further illustrating the means for coupling the keys of two manuals; Fig. 9, is a vertical section illustrating the means for electrically controlling all of the stop knobs; Fig. 10, is a diagrammatic view illustrating the electrical connections of the apparatus preferably employed by me for controlling the operation of the stop bar and for preventing heating of the controlling winding used to secure a crescendo effect; Fig. 11, is a diagram illustrating the connections and apparatus constituting the means for electrically controlling the action of four stop knobs and consequently the pipes controlled thereby and the means for securing crescendo, sforzando or full organ effect, Fig. 12, is a diagram illustrating the electrical apparatus and connections for throwing on, releasing or maintaining any desired stop combinations, and Fig. 13, is a diagrammatic perspective view illustrating, partly in section, the arrangement and construction of the main elements of my invention.

Referring first to Figs. 1 to 4 inclusive, A represents the top of the wind chest of an organ, and a is a single organ pipe connected to said chest. For controlling the admission of air to this pipe I provide an outwardly opening valve a', (that is, a valve so arranged that the air pressure tends to unseat it) having a seat in a piece of flat material a^2 and provided with a rod a^3. It will thus be seen that the valve a' is contained in a chamber formed in the top member of the wind chest and that the pipe a is directly connected to this chamber. For operating each valve a' I provide a double wound magnet B, which, with its armature b, is designed and constructed in the manner fully described and claimed in my pending application for U. S. Patent, No. 306,251, filed March 15, 1906, and which may briefly be described as consisting of a frame of magnetic material constituting a closed or complete magnetic circuit so designed as to provide an auxiliary magnetic circuit which shall include a movable armature.

Referring to the magnet shown in Figs. 1 to 3 inclusive, there are on this frame two independent windings b' and b^2, the wire of which is preferably so placed that when one of them is energized or when both are energized in such manner as to cause the north pole of one winding to be at the same end as that at which is formed the south pole of the other winding, the magnetic flux set up will simply circulate through the closed magnetic frame without appreciable leakage. If, on the other hand, current be sent through the windings so that their respective north poles

are both formed at the same end of the magnet, then the magnetic flux is forced to pass through the armature b, which is thereby drawn toward one end of said magnet; it being pivoted to the opposite end of the magnet, as shown in Fig. 2. This armature is, in the present instance, rigidly connected to the valve stem a^3 and is provided with a spring b^9 of such strength that under ordinary conditions when the magnet is deënergized, or but one of the windings is energized, it is sufficient to hold the valve a' to its seat against whatever air pressure there may be existing within the wind chest.

In order to provide means for "borrowing" pipes, I may make the chamber in the top of the wind chest of larger size in order to accommodate two or any desired number of valves a'; the cover a^4 for this enlarged chamber having in it a corresponding number of seats. Each of said valves may be controlled by a double wound magnet B and is designed to be operated as previously described, or, if desired, a single valve may be used with a multiple wound magnet B' for controlling the same, as indicated in Fig. 4. Said multiple wound magnet, while having a closed circuit magnetic frame, has on said frame two, four, or other even number of windings b' b^2; b^3 b^4, etc. This magnet has an armature b^5, which is pivotally mounted at one end of the frame so that it will be drawn toward the latter only when the magnetic flux from any adjacent pair of windings is in such direction as to form similar poles at adjacent points of the frame. On the other hand, if but a single winding of any pair is energized or if both windings of one pair are energized so as to form unlike poles at adjacent points, then the magnetic flux simply flows through the magnetic frame without in any way affecting the armature.

The method of electrically controlling the opening of valves, such as those shown in Figs. 1 to 4 inclusive, in order to sound any pipe or pipes, is illustrated in its simplest form in Fig. 5, where c, c', c^2, c^3 represent switches whose operation is caused by the keys of the instrument. These are connected in shunt to each other in a circuit having a current generator C and in each shunt there are also connected windings b', for example, belonging to any desired number of valve-operating magnets B; there being in the case illustrated two such windings in circuit with each key. Two stop controlled switches f and f' are also illustrated in this diagram and it will be seen that each of these controls a shunt circuit having in it the second windings b^2 of four of the valve controlling magnets B, so that, for example, when the stop bar is pulled and its switch f' is thereby closed, one coil of each of the four magnets B is energized. In the present instance these four magnets may control the valves of the pipes of the series known as the "flute" of the swell manual, while the magnets B^2 control the diapason pipes of the same manual. With this arrangement it will be seen that the switch f' being closed will permit any of the flute pipes to be sounded when their key switches c, c', c^2, etc., are closed by the proper depression of the keys, for the reason that if the key switch c be closed the windings b' and b^2 of the corresponding flute pipe magnet will be energized in such a way as to cause the magnetic flux to attract the magnet armature and open the valve to said pipe. While it is true that the winding b' of the magnet B^2 in circuit with the key switch c is also energized, as well as one winding of each of the remaining magnets of the flute pipes, this will have no effect; for, as pointed out, the magnetic flux simply flows through the magnetic frames of these magnets without attracting their armatures.

If it be desired that the operation of the keys shall cause sounding of both the flute and diapason pipes, then both the stop switches f and f' are closed, thereby energizing all of the windings b^2 belonging to both of said sets of pipes. The depression of any of the keys of this manual will, as before, result in the energization of both windings b' in circuit with it and as there will then be two magnets in which the magnetic flux forms similar poles at adjacent points, the armatures of these two magnets will be attracted and their valves a' opened, with consequent sounding of both the flute and diapason pipes.

The preferred form of stop bar employed by me and the device for operating this is illustrated in Fig. 9, in which D represents the stop rod or bar having a knob d of the well known form, whereby it may be manually pulled out, if desired. Said bar passes axially through a magnet E, which may have any desired number of windings, there being in the case illustrated four of these e, e', e^2 and e^3. Said magnet is mounted in any desired manner upon the rear face of that portion e^4 of the organ frame from which the stop bars project and has an armature e^5 carried upon that portion of the stop bar which projects rearwardly outside of the magnet. Said armature is preferably so fitted to the stop bar that it bears on it with considerable friction and when attracted to the magnet causes it to move longitudinally through the same. If, after such movement, a further outward longitudinal movement of the stop bar be given, as, for example, by an outward pull on the stop knob, said bar will slide through the armature to a limited extent. When the stop knob is pushed inwardly the armature, of course, moves with it until it engages the pins e^6 mounted in any desired manner upon the organ frame, when such movement ceases, though the rearward movement of

the bar may be continued by hand until it has been moved to its full "in" position.

Between the magnet E and its armature e^5, I preferably mount any suitable form of spring, as e^7, so that after the energization of the magnet has drawn the armature toward it and moved the stop bar outwardly, its subsequent deënergization will result in the spring forcing said armature and with it the bar D back to the normal "in" position.

In order to maintain the stop bar in its full "out" position when it has been manually moved thereto, I provide any desired form of catch, such as is shown in Fig. 9, having a pair of springs carried upon any suitable supporting structure e^9 and so bent that they fall into a groove e^{10} or some equivalent construction only when the stop bar has been moved outward to its fullest extent, as by hand. Under ordinary conditions, however, when the stop bar is operated solely by the energization of the magnet E, the movement is not sufficient to bring the groove e^{10} so that said spring can enter it.

The stop switch f may consist of two contact brushes f^2 and f^4 mounted in any desired manner upon the frame of the organ so as to engage a metallic contact piece f^3 carried upon the non-conducting stop bar when this latter has been moved outwardly, either by hand or by the magnet E.

I preferably provide for each of the stop controlling magnets E a plurality of windings, as illustrated in Fig. 9, so that the stop switches may be operated electrically to throw in or out of service certain groups of pipes to make various desired "combinations", and a diagram of connections of the windings of four stop magnets with their controlling combination switches is illustrated in Fig. 11, said magnets being illustrated at E', E^2, E^3 and E^4. Of these stop magnets, the first two may, for example, control the switches (not shown but preferably similar to that shown in Fig. 9) in circuit with the magnet-windings respectively belonging to the two sets of pipes controlled from the swell manual, while the two latter similarly may control switches in circuit with valve controlling windings of two other sets of pipes of the great manual, and it may be noted at this point that while both here and in the other diagrams illustrated I have shown the minimum number of units compatible with an understanding of the device, there are in each instance sufficient of these to be employed to fulfil the full requirements of a modern organ.

In Fig. 11, there are shown four "combination" switches g, g', g^2 and g^3, and also two switches g^4 and g^5 under the control of the foot of the performer, of which the first may be operated to give a crescendo effect and the other to produce a full organ effect.

The combination switches g, g', g^2 and g^3 are preferably of such construction as to remain closed when once closed; being, if desired, of the "snap" type, while the foot switch g^5 for the full organ effect, is a similar two-point switch so connected as to energize, when it is closed, one winding of each of the magnets E', E^2, E^3 and E^4, and so result in the pulling out of all of the stop bars controlled thereby. For this purpose one of the points of said switch g^5 has in series with it the windings e of the magnets E^3 and E^4, while the other has in series with it the windings e of the remaining magnets E' and E^2. The crescendo switch g^4 is of the multiple point type, being so constructed as to successively close or complete the circuits which include the windings e' of each of the two stop magnets. It is to be noted that these latter are wound to energize their magnet cores in the same direction as that caused by the windings e.

The switch g is connected in series with two windings e^3 respectively placed upon the cores of the swell stop magnets E' and E^2 and these two windings e^3 are in turn in series with the windings e of these same magnets for the purpose hereafter noted. Similarly, the combination switch g' is in circuit with the two windings e^2 of the swell stop magnets E' and E^2 and with the two windings e of the same magnets. The combination switches g^2 and g^3 are in like manner connected to windings of the stop magnets E^2 and E^3 belonging to the great manual.

Preferably adjacent to each stop knob d I place a reversing switch H, as suggested in Fig. 9, having a small operating handle h. Each of these reversing switches, of which there may be any desired number for each stop switch, depending upon the number of windings e^3 and e^2 employed, is connected in series with one of these windings, so that if in one instance the magnetic flux set up by the winding e^3, flows in the same direction as the flux set up by the winding e, then that particular stop bar will be operated when the switch g is closed. If, on the other hand, the reversing switch H be so manipulated that the current flows through winding e^3 so as to set up a magnetic flux opposing that caused by the winding e, then even though the combination switch g be closed there is no energization of that particular magnet. It will, therefore, be seen that the principal reason for connecting the windings e^2 and e^3 in series with the winding e is to make possible any desired stop combinations, so that while certain stops are in normal condition and may be actuated to close their proper switches when the combination switches g, etc., are closed, others will be inoperative under the same conditions.

If it be desired to electrically control the opening and closing of the combination switches g, g', g^2, g^3, g^4, g^5, g^6 and g^7, this

may be accomplished by apparatus and connections such as are illustrated in Fig. 12, where said switches are shown as designed to be actuated by the operation of magnets or solenoids J, J'–J⁷. Each solenoid in the case illustrated has three windings j, j' and j^2 and is provided with connections to switches, as k, k^3, whereby two of these windings may be caused to neutralize each other, so that the third winding is free to cause movement of the core carrying the movable switch element in one direction, or others of the windings may be short circuited to leave but one winding active and so move the core in the opposite direction. While this is my preferred method for accomplishing the end desired, it will be understood that other means for controlling the switches may be substituted therefor without departing from my invention.

In the case illustrated, the solenoids J and J' control two combination switches of the great manual, while, in addition, there are solenoids J² and J³ which control similar switches belonging to the associated pedal pipes of the same manual. For the purpose of closing the switch g, belonging to the combination solenoid J and its associated pedal solenoid J², I provide a switch k, and it will be seen that when this latter is closed current flows from the positive side of the battery C through one branch terminal of the switch, through the windings j and j' of the solenoid J, thence to the winding j^2 of the solenoid J' and to the winding j^2 of the solenoid J, from whence the circuit is completed back to the negative terminal of the battery.

Since the windings j' and j^2 are so placed as to neutralize each other under these conditions, the winding j alone is effective and the core of the solenoid is so moved as to close the switch g controlled by it; it being understood that this switch remains closed even though the switch k be only temporarily closed. When it is desired to open this switch and so render inactive the combination controlled thereby, I close the switch k', (the switch k being open) which, it will be seen, is so connected as to be capable of short circuiting the windings j and j' of the solenoid J, it being noted that the switch k is preferably of the open-circuit type. Current then flows through windings j^2 of both solenoids J and J' with the result that the latter of these windings acts upon the core of the solenoid J so as to open the switch g. It will be noted that the switch k has a second point or terminal in circuit with the solenoid J² of the associated pedal combination controlling means, so that this solenoid is always energized in unison with the solenoid J.

For the control of the solenoids J' and J³, I provide switches k^2 and k^3, whereby, as before described, the combination switches governed by said solenoids may be closed or opened. Restoring switches k^4, k^5, k^6 and k^7 are similarly provided for the swell manual and its associated pedal pipes.

In order that all of the combination switches g, etc., may be simultaneously opened, I provide a general releasing switch k^8 so connected as to fulfil in itself the functions of the individual releasing switches k', k^3, k^5, k^7.

In order to cut down the amount of current flowing when the stop-controlling magnet-coils e are energized, I may provide means, such as is illustrated in Fig. 10, whereby a body of resistance e^8 is inserted in shunt with such windings by the closing of a switch g^8 controlled by the stop bar.

Under operating conditions the closure of the switch g^4, energizes a winding e' on one of the magnets E and so moves the stop bar D that the switch g^8 is closed, thereby placing in shunt with this winding of the magnet, the body of resistance e^8 so that the current flowing to said winding is cut down and the latter incidentally prevented from heating. The main object of this resistance e^8 is to prevent the winding e' from being short circuited and even though it does materially cut down the current flow in said winding, there is still sufficient current to maintain the armature against the end of the magnet after it has once been moved there.

In order to couple the manuals of the organ at will, I provide such an arrangement of parts as is shown in Figs. 7 and 8, where m, for example, represents the keys of the swell manual and n the keys of the great manual. Each key m is mechanically connected to a lever m' and similarly each key n is connected to a lever n' and each of said levers is provided in the present instance with two contact pieces m^2 and m^3, and n^2 and n^3, respectively. A current conductor p serves to connect each of the contact pieces with one pole of the current generator C and there are, in addition, two sets of bus bars q and q', of which the first set is placed so as to be engaged by each of the contact pieces m^2 and n^2 whenever the keys to which these pieces belong are depressed. Similarly, the bus bars q' are so placed that they are engaged by the contacts m^3 and n^3 when any of the keys to which these belong are operated.

Extending transversely of the levers m' and n' are two axially revoluble bars m^4 and n^4 of elliptical cross section so placed that when they are turned into the position illustrated in the case of the bar m^4 they will prevent the contact pieces to which they are adjacent engaging the bus bar, when the key is depressed, while, on the other hand, when they are turned to the position in which the bar n^4 is illustrated, they permit such engagement of the contact pieces with the bus bar to which they are adjacent.

With the apparatus arranged as shown in

Fig. 7, which, it will be understood, represents two keys and their associated parts required for controlling two pipes belonging to two different manuals, if the key n be depressed, not only will the contact piece n^2 engage its bus bar q and so energize the winding b' of the magnet for controlling one of the great pipes, but the contact piece n^3 will also engage its bus bar q' and similarly energize the winding b' of one of the swell pipe magnets. If, now, the stop switches f and f' are closed, both a swell and a great pipe will be sounded by operation of the key n. In the case of the key m, and with the bar m^4 in the position shown, the depression of the said key would merely result in the sounding of the single swell pipe normally controlled by it, since, while the contact piece m^3 is free to engage the bus bar q', the contact piece m^2 is prevented from engaging its bus bar q.

In Fig. 6, I have shown a diagram illustrating the connections whereby the pipes of either of two stops may be sounded by coupling the two manuals together in the manner illustrated in Figs. 7 and 8; that is to say, any of the pipes controlled by the magnets B or B^2 may be sounded from the manual having the switch c and the keys m, or these pipes may be sounded from the manual having the keys n, if the stop switches f and f' be properly closed.

I claim as my invention:

1. An organ including a plurality of pipes, valves for said pipes, and magnets each with a plurality of windings for controlling said valves, a source of current, a series of keys, a key-controlled switch in circuit with one winding of each magnet, a series of stops, and a stop controlled switch in circuit with another winding of each magnet, substantially as described.

2. The combination in an organ, of a series of pipes, a valve for controlling the flow of air to each pipe, a magnet for independently operating each valve wound with a plurality of sections, each section consisting of a pair of windings capable of operating the valve only when both of them are energized, and means for controlling the flow of current to said windings, substantially as described.

3. An organ having a plurality of pipes, valves for controlling the flow of air to said pipes, electromagnetic selective means including multiple-wound magnets for causing at will the operation of any valve or combination of valves, and means for independently energizing a plurality of the windings of any magnet to cause them to coöperate to actuate a valve, substantially as described.

4. An organ including a plurality of pipes having valves for controlling the admission of air thereto, a double wound magnet for each valve, a source of current, a series of keys connected to said source and each in circuit with a magnet winding, and a stop controlled switch in circuit with the second windings of said magnets, substantially as described.

5. The combination in an organ, of a series of pipes, valves for controlling the flow of air thereto, multiple-wound magnets for controlling said valves, a stop switch in circuit with one winding of all of said magnets, a series of keys each in circuit with the other winding of one of the magnets, and a source of current for energizing said magnets, substantially as described.

6. An organ including a plurality of series of pipes, valves for controlling the admission of air to said pipes, multiple wound magnets connected to actuate said valves, one winding of a plurality of the magnets of each series having a stop switch in circuit therewith, a series of key switches respectively connected to the second magnet windings of a plurality of magnets of different series, with means for supplying current to said magnets, substantially as described.

7. In an electrically controlled organ, the combination of keys, stops, pipes, valves for controlling the admission of air to said pipes, multiple wound magnets for actuating said valves, switches respectively connected to the windings of each magnet, the switch of one winding of each magnet being controlled by a stop, and the switch of another winding being controlled by a key, with electro-magnetic means for operating said stop switches, substantially as described.

8. An electric organ having draw rods, a switch controlled by each rod, magnets for actuating said rods, means for controlling said magnets, pipes for the organ having controlling valves, multiple wound magnets, each having a winding in circuit with one of said switches for actuating the valves, and other means for controlling the current flow to the remaining windings of the magnets, substantially as described.

9. An electrically controlled organ including stop devices each consisting of a movable bar, an electric switch controlled thereby, an armature on the bar, a magnet for actuating said armature, a spring for normally maintaining said armature away from the magnet, with means for controlling the energization of the magnet, a device for operating the bar by hand, and means independent of the magnet for holding the bar from moving when the switch is closed, substantially as described.

10. An electrically controlled organ, having a series of stop controlling devices, each consisting of a movable bar having a knob, an armature on the bar but movable relatively thereto, a magnet for the armature for moving the bar to its outer position, means for controlling the operation of said

magnet, and means independent of said magnet for holding the bar in said outer position, substantially as described.

11. An electrically controlled organ, including a series of stop controlling devices, each provided with a magnet, a stop bar, an armature thereon, a switch having its movable member carried by said stop bar, a spring for maintaining the switch open and the armature distant from the magnet, means independent of the magnet for maintaining the switch closed, and means for controlling the magnet, substantially as described.

12. An electrically controlled organ including a plurality of series of pipes and valves for controlling the admission of air thereto, multiple wound magnets for controlling the valves, key controlled switches for governing the current flow to one winding of any magnet or magnets, stop switches for controlling the flow of current to the second winding of the magnet of any series of pipes, magnets for operating said latter switches, and controlling switches for said latter magnets, substantially as described.

13. The combination in an electrically controlled organ having a number of series of pipes and mechanism controlling the sounding of said pipes, of a series of switches for controlling the different elements of said mechanism, stop mechanism for controlling said switches, and multiple wound magnets for actuating said stop mechanism, with means for controlling the operation of said latter magnets, substantially as described.

14. An electrically controlled organ including a plurality of series of pipes and valves for controlling the admission of air thereto, multiple wound magnets for controlling the valves, key controlled switches for governing the current flow to one winding of any magnet or magnets, stop switches for controlling the flow of current to the second windings of the magnets of any series of pipes, multiple wound magnets for controlling the operation of said stop switches, and a plurality of switches respectively in circuit with the windings of said stop-switch magnets for controlling the same, substantially as described.

15. An electrically controlled organ including a plurality of series of pipes and valves for controlling the admission of air thereto, means including stop switches for controlling said valves, multiple wound magnets for controlling the operation of said stop switches, a plurality of switches respectively in circuit with the windings of said stop magnets for controlling the same, and means for rendering inoperative at will any one of said stop switch controlling magnets, substantially as described.

16. An electrically controlled organ including a plurality of series of pipes and valves for controlling the admission of air thereto, multiple wound magnets for controlling the valves, key controlled switches for governing the current flow to one winding of any magnet or magnets, stop switches for controlling the flow of current to the second winding of the magnets of any series of pipes, multiple wound magnets for controlling the operation of said stop switches, a plurality of switches respectively in circuit with the windings of said stop magnets for controlling the same, and means for rendering inoperative at will any of said stop switch controlling magnets, substantially as described.

17. An organ including a plurality of pipes, a source of air, a valve for each pipe for admitting air to it from said source, a magnet for each valve, a series of keys, each having a switch in circuit with one of the magnets, a source of current for said apparatus, and stop mechanism including switches and electrical connections arranged to co-act with said key switches to control the energization of the magnets and the sounding of the pipes, substantially as described.

18. An organ including a plurality of pipes, a source of air, a valve for each pipe for admitting air to it from said source, a separate magnet for each valve, a series of keys, each key having a switch in circuit with the magnet of the corresponding pipe, and stop mechanism including means co-acting with each of said magnets for rendering the same effective to operate the valve, with a source of current for said apparatus, substantially as described.

19. An organ including a plurality of pipes, a source of air, a valve for each pipe for admitting air to it from said source, a separate magnet for each valve, a series of keys, each having a switch in circuit with one of the magnets, stop mechanism including an electro-magnetic device for each one of the pipes for rendering the magnet thereof effective at will to operate its valve, and switches for controlling the energization of said devices, with a source of current for said apparatus, substantially as described.

20. An organ including a plurality of pipes, valves for said pipes, a separate magnet for controlling each of said valves, a source of current, a series of keys, a series of stops, key controlled switches and stop controlled switches, with circuits respectively including one of the key controlled switches, and a stop controlled switch for controlling the energization of each magnet, substantially as described.

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

WILLIAM R. WHITEHORNE.

Witnesses:
R. W. LEIBERT,
HELEN E. WHITEHORNE.