

Aug. 18, 1959

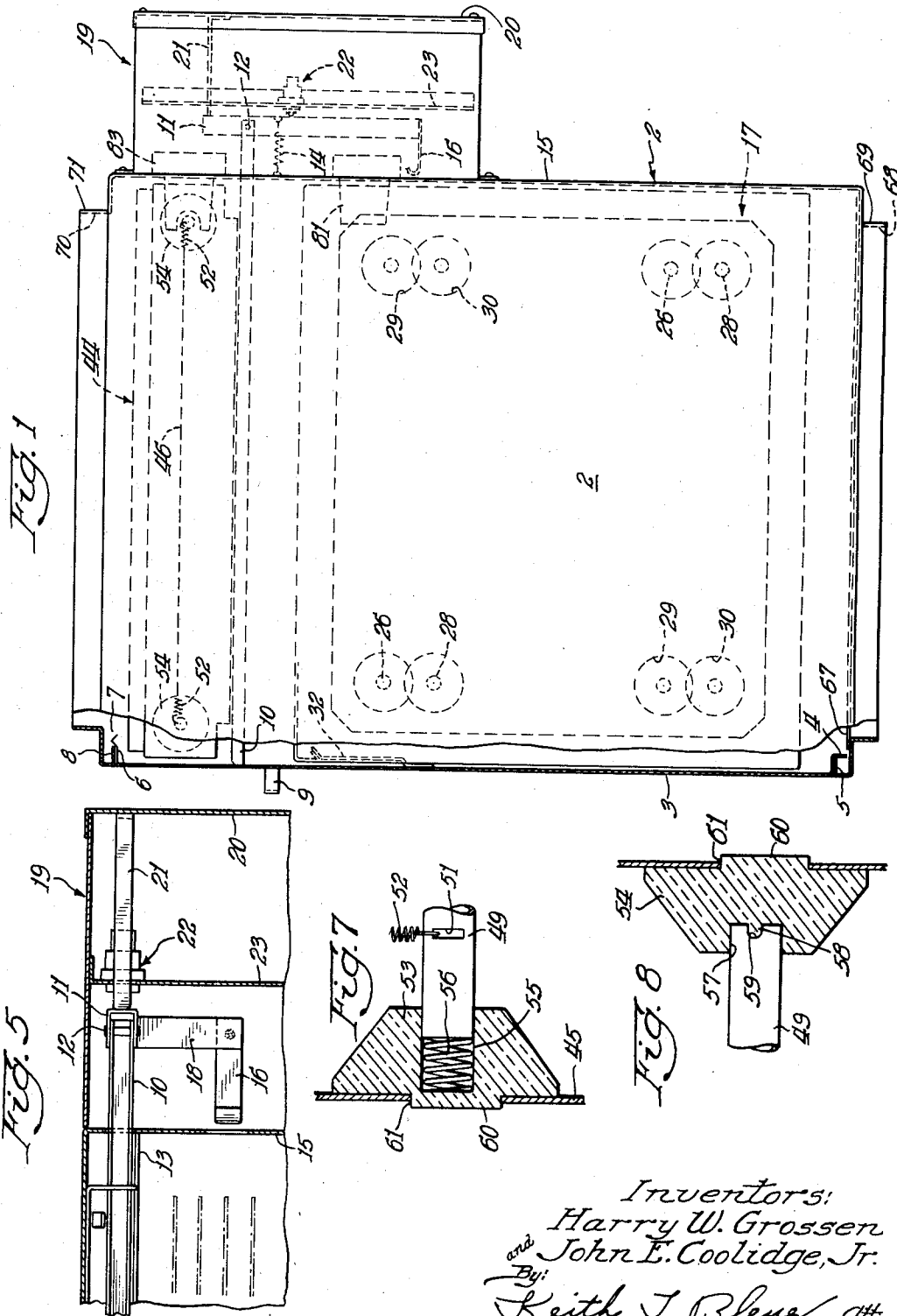
J. E. COOLIDGE, JR., ET AL

2,900,042

ELECTRICAL PRECIPITATOR

Filed March 15, 1957

4 Sheets-Sheet 1



Inventors:
Harry W. Grossen
and John E. Coolidge, Jr.
By: Keith J. Blum atty.

Aug. 18, 1959

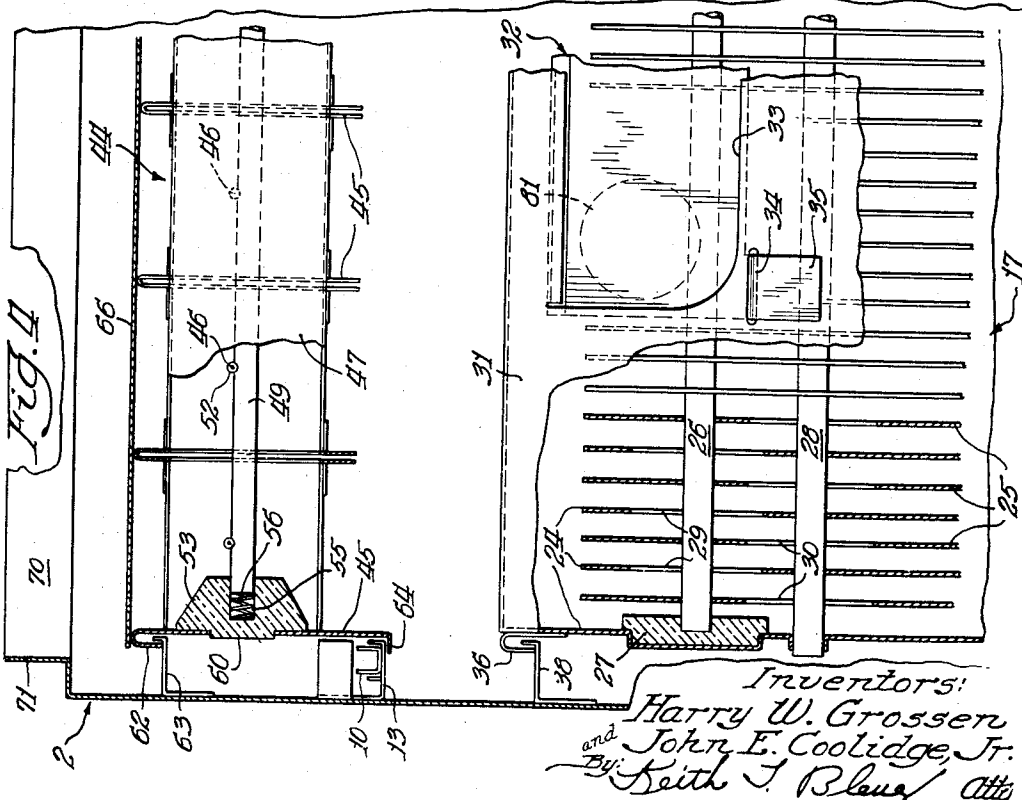
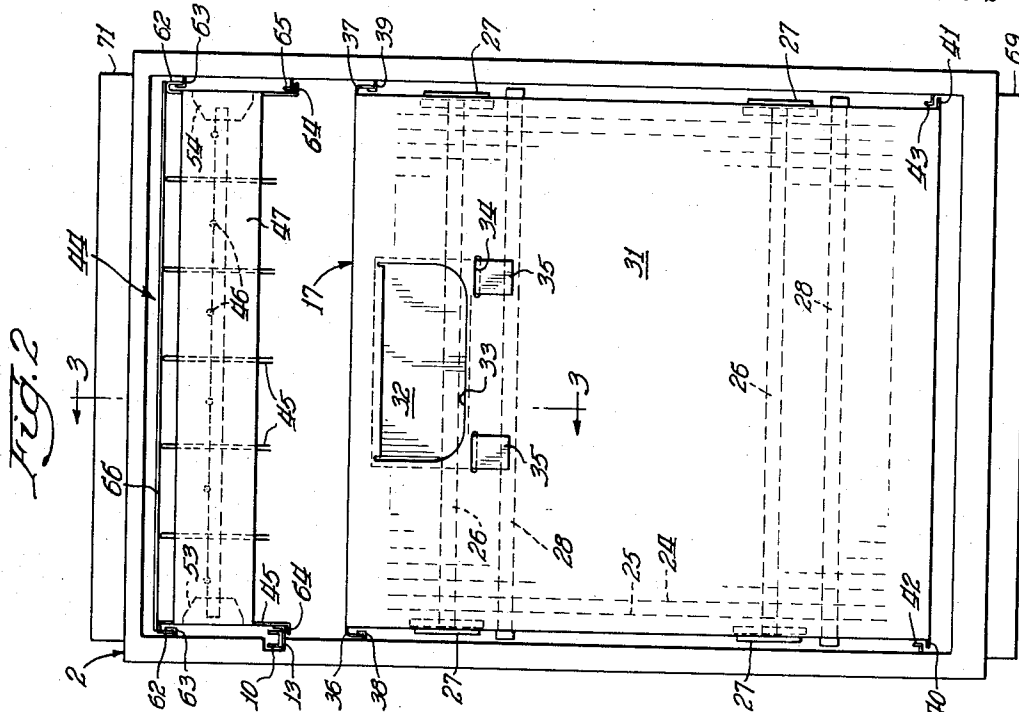
J. E. COOLIDGE, JR., ET AL

2,900,042

ELECTRICAL PRECIPITATOR

Filed March 15, 1957

4 Sheets-Sheet 2



Inventors:
Harry W. Grossen
and
John E. Coolidge, Jr.
By Keith J. Blum att

Aug. 18, 1959

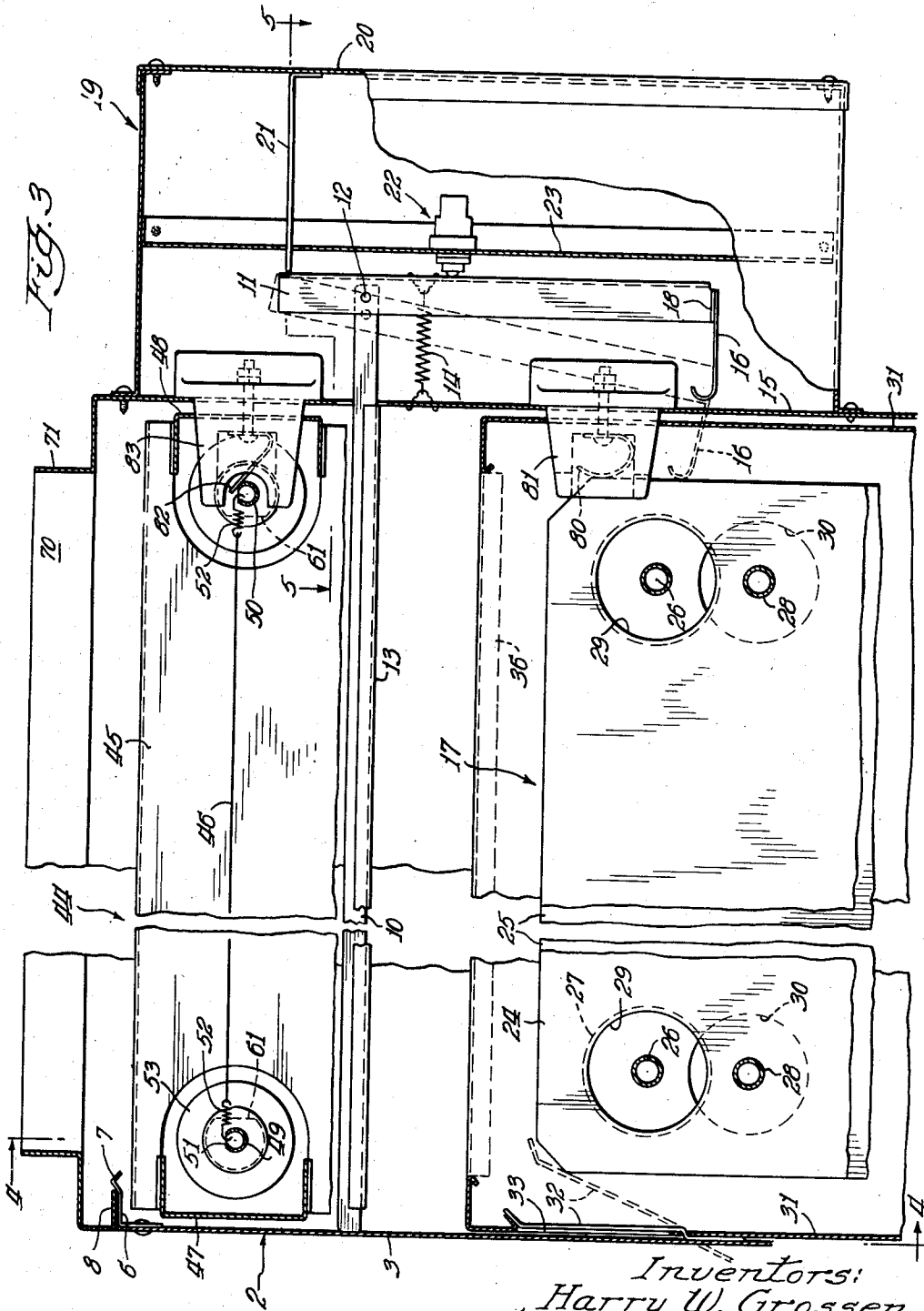
J. E. COOLIDGE, JR., ET AL

2,900,042

ELECTRICAL PRECIPITATOR

Filed March 15, 1957

4 Sheets-Sheet 3



Inventors:
Harry W. Grossen
and John E. Coolidge, Jr.
By: Keith J. Blair atty.

Aug. 18, 1959

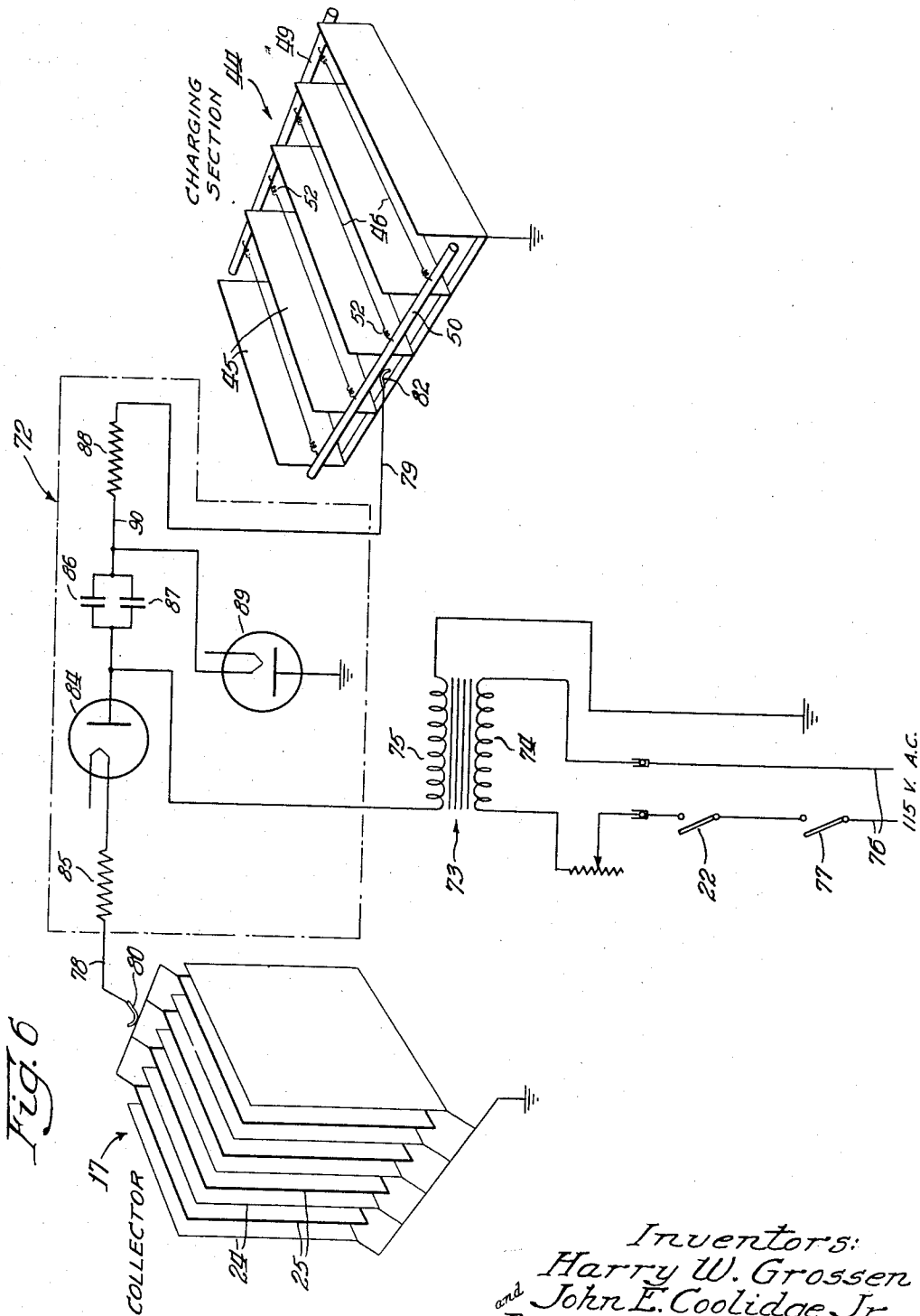
J. E. COOLIDGE, JR., ET AL

2,900,042

ELECTRICAL PRECIPITATOR

Filed March 15, 1957

4 Sheets-Sheet 4



Inventors:
Harry W. Grossen
and
John E. Coolidge, Jr.
By: Keith J. Blum atty.

1

2,900,042

ELECTRICAL PRECIPITATOR

John E. Coolidge, Jr., Arlington Heights, and Harry W. Grossen, Chicago, Ill., assignors to Borg-Warner Corporation, Chicago, Ill., a corporation of Illinois

Application March 15, 1957, Serial No. 646,293

14 Claims. (Cl. 183—7)

This invention relates to an electrical precipitator for precipitating dust or smoke from the atmosphere; more particularly, the invention relates to precipitators of the type in which the air to be cleaned is first ionized by an ionizing device and is thereafter passed through a precipitating device comprising a plurality of parallel plates, alternate plates being charged in one polarity and intervening plates being charged in the opposite polarity.

One of the objects of the present invention is to provide a precipitator of the type described which is compact and which can be conveniently housed in a single unit and readily installed in connection with a heating furnace. It is also an object to provide improved safety features in such a precipitator to prevent the possibility of contact with the high voltage generated by a transformer for the ionizing and precipitating sections of the precipitator.

A further object of the invention is to provide a charging or ionizing section wherein the charging wires are anchored in an improved way so as to insure long life.

It is also a further object to provide a uniquely designed charging section which is readily assembled, thereby lowering manufacturing cost.

The invention consists of the novel constructions, arrangements and devices to be hereinafter described and claimed for carrying out the above stated objects and such other objects as will be apparent from the following description of a preferred embodiment of the invention, illustrated with reference to the accompanying drawings, wherein:

Fig. 1 is a side elevational view of an electrical precipitator showing the cabinet and internal parts thereof;

Fig. 2 is a front view of the precipitator with a door of the cabinet removed, and also showing internal parts thereof;

Fig. 3 is a fragmentary cross sectional view on an enlarged scale of the precipitator taken on line 3—3 in Figure 2;

Fig. 4 is a fragmentary cross sectional view of the precipitator taken on line 4—4 in Fig. 3;

Fig. 5 is a fragmentary cross sectional view of the precipitator taken on line 5—5 in Fig. 3;

Fig. 6 is a schematic illustration of a charging section assembly, a collector section assembly and the electrical system of the precipitator;

Fig. 7 is a cross sectional view of an insulator used in the charging section assembly; and

Fig. 8 is a cross sectional view of another insulator used in the charging section assembly.

Like characters of reference indicate like parts in the several views.

Referring now to the drawings, a precipitator cabinet 2 is shown having a door 3 with a downwardly extending L-shaped lower end 4 which is hooked over a ledge 5 at the lower end of the cabinet when the door is being put in place on the cabinet. The door has a pair of laterally extending flat spring members 6 with V-shaped ends 7 which co-act with a laterally inwardly extending

2

flange 8 attached to the upper end of the cabinet, so that when the cabinet door is closed, the V-shaped ends 7 spring downwardly when coming in contact with the flange 8 and snap upwardly when it has traveled beyond the end of the flange 8 to thereby lock the door 3 in its closed position. A handle 9 is also provided for the purpose of pulling the door open in which event the V-shaped ends 7 of the flat spring members 6 spring downwardly and disengage themselves from the flange 8, thereby permitting the door to be opened.

The door when closed, contacts an interlock push rod 10 and moves it rearwardly. The interlock push rod 10 is pivotally connected to an actuating lever 11 at one end by a pin 12 and is slidably held in position by a guide support channel 13 fixed to the inside of the cabinet 2.

A tension spring 14 is connected to the actuating lever 11 at a point below the pin 12 and to a back panel 15 of the precipitator cabinet 2. At its lower end the actuating lever 11 has attached thereto a shorting spring 16 extending generally in a horizontal direction toward a collector section assembly 17. It should be noted that the actuating lever 11 has an offset portion 18 at its lower end as shown in Fig. 5, on which the shorting spring 16 is mounted.

A power supply assembly 19 is attached to the upper portion of the cabinet back panel 15. The power supply assembly 19 has a cover 20 to which is attached an arm 21 which extends toward the actuating lever 11 and serves as a stop means for the upper portion thereof. The power supply assembly 19 carries an interlock switch 22 mounted therein by means of a rail 23, in close proximity to the actuating lever 11.

The collector section assembly 17 comprises a series of alternate, spaced negative and positive collector plates 24 and 25 respectively. The positive collector plates 25 are fastened and held in spaced relationship to each other by means of four positive plate holding tubes 26. The positive plate holding tubes 26 are mounted at both ends by insulators 27 which are carried by the two end negative collector plates 24 of the collector section assembly 17. The negative plates 24 are held fixed in spaced relation to each other by means of negative plate holding tubes 28. The negative collector plates 24 and the positive collector plates 25 are spaced alternately and are provided with openings 29 and 30 respectively which are large enough to prevent contact with the positive and negative plate holding tubes 26 and 28 respectively.

Side panels 31 connect together the two end negative collector plates 24, so that the side panels 31 and the end negative collector plates 24 form an open-ended receptacle, which is disposed within the cabinet 2. Since the side panels 31 and the end negative collector plates 24 are connected together, and since the negative collector plates are all fixed together by means of the negative holding tubes 28, and the positive collector plates are fixed together by means of the positive holding tubes 26, it can be seen that the collector section assembly 17 is an integral unit which may be removed as a unit from the cabinet 2 when the door 3 is opened.

Referring now in particular to Fig. 3, the side panel 31 adjacent the door 3 is provided with an interlock cover 32. The interlock cover 32 is positioned on the inside of the side panel 31 and is effective to close an opening 33 in the side panel 31 when the cabinet door 3 is closed. The interlock cover 32 is pivotally hinged at 34 in proximity to the lower edge of the side panel opening 33 and has two portions 35 extending through the side panel 32 which are effective to co-act with the cabinet door 3 to move the interlock cover 32 so as to close the side panel

3

opening 33 when the cabinet door 3 is in closed position, as will be more fully described hereinafter.

The collector section assembly 17 as heretofore pointed out is an integral unit and is slidably mounted within the cabinet 2 of the precipitator. The slidable mounting may be by means of a pair of downwardly depending rails 36 and 37 fixed to the upper edges of the end negative collector plates 24 of the collector section assembly 17 and receiving angle members 38 and 39 which are attached to side panels of the precipitator cabinet 2. Flanges 40 and 41 are provided on the lower edges of the end negative collector plates 24 and co-act with a pair of angle rails 42 and 43 attached to the side panels of the cabinet 2 to prevent upward movement of the collector section assembly 17 in the cabinet 2.

The precipitator includes a charging section assembly 44 disposed above the collector plate assembly 17. The charging section assembly 44 includes negative plates 45 and charging wires 46 disposed between the negative plates 45. The negative plates 45 are held spaced from each other and are connected together by two end plates 47 and 48, whereby the charging section assembly 44 is made into an integral unit. The charging wires 46 are held in position between the negative plates 45 and are connected to wire retaining tubes 49 and 50. These connections are by means of holes 51 in the tubes 49 and 50 and tension springs 52 which are attached to the ends of the charging wires 46 and are hooked under tension through the holes 51. The wire retaining tubes 49 and 50 extend into hollow insulators 53 and 54 which are mounted on the end negative plates 45. The hollow insulators 53 are provided with relatively deep cylindrical recesses 55 receiving ends of the wire retaining tubes 49 and 50, and a compression spring 56 is provided in each of the deep cylindrical recesses 55 between the bottom of the opening and the adjacent end of the wire retaining tube 49 or 50. The hollow insulators 54 have a cylindrical recess 57 of shorter length than the deep cylindrical recess 55 and have a key portion 58 extending from the bottom of the recess for the purpose of meshing with a slot 59 in the opposite ends of the wire retaining tubes 49 and 50. The hollow insulators 53 and 54 have protruding cylindrical bosses 60 having flats 61.

The end negative plates 45 of the charging section assembly have openings therein having the same configuration as the protruding cylindrical bosses 60, and the hollow insulators 53 and 54 are mounted on the end negative plates 45 with the protruding cylindrical bosses 60 extending through the openings in the end negative plates 45 and holding the wire retaining tubes 49 and 50 properly positioned with respect to the end negative plates 45. The flats 61 prevent the hollow insulators 53 and 54 from turning with respect to the end negative plates 45, and the key portions 58 disposed in the slots 59 prevent the wire retaining tubes 49 and 50 from turning with respect to the hollow insulators 54 so that the tension on the charging wires 46 does not cause turning of the wire retaining tubes 49 and 50.

The charging section assembly is mounted in the upper portion of the precipitator cabinet 2 in a fashion similar to the collector assembly 17. The end negative plates 45 are provided with rails 62 which receive up-turned flanges of sheet metal angles 63 fixed to the side panels of the cabinet 2. The end negative plates 45 are provided with laterally extending flanges 64 on their bottom edges, one of which overlies the guide support channel 13 and the other of which overlies a flange 65 fixed to a side panel of the cabinet 2. The charging assembly 44 may be slid in and out of the cabinet 2 in a manner similar to the assembly 17, with the rails 62 riding on the angles 63, and the flanges 64 cooperating with the guide support channel 13 and the flange 65 prevent undue upward movement of the charging assembly 44 in the cabinet 2.

Two screens 66 and 67 are provided in the cabinet 2. The screen 66 is a safety screen for preventing accidental

4

contact with the charging wires 46 and is positioned on top of the plates 45. The screen 67 is a lint screen and is positioned at the bottom of the cabinet 2.

The precipitator is particularly adapted to be used in a hot air home furnace and may be connected into the air return duct of such a furnace. The cabinet 2 is provided with an open air outlet end 68 bordered by a flange 69 and has an opposite open air inlet end 70 bordered by a flange 71. The flanges 69 and 71 may be used for attaching the precipitator into the furnace return duct.

The power supply assembly 19 includes, particular reference here being made to Fig. 6, a conventional rectifying circuit 72 and a transformer 73 supplying the rectifier circuit with electric power and comprising primary and secondary windings 74 and 75, respectively. The source of power for the transformer may be the usual household 115 volt source 76 connected to the primary winding 74. The interlock switch 22 and a usual on-off switch 77 are connected in series between the 115 volt source 76 and the primary winding 74.

It is contemplated that the secondary winding 75 shall supply approximately 5000 volts and that the rectifying circuit 72 shall produce a direct voltage of approximately 7500 volts on an outlet lead 78 and a direct voltage of approximately 8000 volts on an output lead 79. The lead 78 is connected to the collector plate assembly 17, and the lead 79 is connected to the charging section assembly 44.

The lead 78 is connected to the positive plates 25 of the collector plate assembly 17 through a spring contact 80 disposed in an insulator 81 which is carried by the back panel 15 of the cabinet 2. The lead 79 is connected with the tube 50 by means of a spring contact 82 disposed in an insulator 83 mounted on the rear panel 15 of the cabinet 2. The negative plates 24 of the collector plate assembly 17 are in electrical connection with the cabinet 2, and the negative plates 45 of the charging section assembly 44 are also in electrical connection with the cabinet 2, and the rectifier circuit 72 is grounded also to the cabinet 2 for the purpose of maintaining the charging wires 46 of the charging assembly 44 and the positive plates 25 of the collector plate assembly 17 at a positive potential with respect to the negative plates 45 and 24 respectively.

The rectifying circuit 72 is of the conventional type comprising a rectifier 84 with a resistor 85 connected between the cathode side of the rectifier and the collector section assembly. Condensers 86 and 87 in parallel and a resistor 88 are connected between the other side of the rectifier 84 and the charging section 44. Another rectifier 89 is connected at its cathode side to a lead 90 between the resistor 88 and the two condensers 86 and 87. The other side of the rectifier 89 is grounded.

In this circuit, during one-half of the cycle, the rectifier 84 conducts and develops positive voltage across the positive collector plates 25. The voltage at the outlet lead 78 is a uniform direct voltage because of the filtering action due to the electrical capacity of the positive collector plates. During the alternate half cycle, the rectifier 89 conducts and the parallel condensers 86 and 87 are charged. On the other one-half cycle during which the rectifier 84 conducts, the voltage of the transformer secondary 75 and the voltage on the condensers 86 and 87 are additive and develop a peak voltage at the output lead 79 of approximately twice that of the transformer secondary 75 for application across the charging section assembly. Resistors 85 and 88 are of a proper value to limit a shunt circuit current therethrough and to dampen circuit oscillations excited by arcing at the collector section assembly, on charging.

When the precipitator is connected into a duct of a furnace and put in operation, the interlock switch 22 and the Off and On switch 77 are closed so as to produce a potential at the leads 78 and 79 whereby the charging wires 46 charge at a plus (+) potential with respect to

5

the plates 45 in the charging section assembly 44 and the positive plates 25 are charged at a plus (+) potential with respect to the negative plates 24 of the collector section assembly 17.

As the air flows through the cabinet 2, it passes between the negative plates 45 and around the charging wires 46 so that the dust particles in the air are ionized. After thus being ionized, the particles move with the air current into the collector section assembly 17 between the plates 24 and 25 and due to the ionization of the dust particles, they are collected on the plates 24 and 25 depending on the charge on each of the particles.

Periodically, the collector section assembly 17 must be removed for cleaning and in order that this may be done conveniently, it has been so designed, as heretofore mentioned, that it is slidably removable from the cabinet after the door 2 has been opened.

When the door 3 of the cabinet or the cover 20 of the power supply assembly is removed, it is very important that the power supply be automatically shut off so as to avoid the danger of a person coming in contact with the high voltage in the electrical circuits, and it is also important that the positive plates of the collector section 17 be shorted automatically at the time the power supply is cut off so as to cancel out any hold over high voltage on the positive plates. It is particularly important to guard against possible contact with the high voltage generated in the precipitator because the precipitator has been designed primarily for household use, and, therefore, persons coming in contact with it, generally, would not have sufficient technical knowledge with respect to high voltage electrical equipment to avoid harm. The automatic shutting off of the power supply and shorting of the positive plates 25 are accomplished by virtue of the unique arrangement of the interlock push rod 10 and the actuating lever 11 in association with the cabinet door 3, the power supply assembly cover 20 and the interlock switch 22.

The interlock switch 22 is of the type which is normally open. In order to close it, it is necessary that a button on the switch be pushed. When the pressure on the button is removed, the switch automatically assumes an open position.

Specifically, when the cabinet door 3 is opened, the push rod 10 urged by the spring 14 moves forwardly, causing the actuating lever 11 to pivot on the end of the arm 21 attached to the cover 20, thereby moving the shorting spring 16 attached to the lower end of the actuating lever 11 toward the collector plate assembly and contacting one of the positive plates 25 so as to short the positive plates 25 with respect to the negative plates 24. At the same time, the forward movement of the actuating lever 11 breaks its contact with the interlock switch 22, permitting the switch 22 to open and shut off the power supply to the transformer 73.

The spring contactor 80 has been provided to automatically make or break, respectively, the electrical connection with the collector section assembly 17 when it is positioned within the cabinet or removed therefrom.

The charging section assembly has been similarly designed so that it may also be slidably removed when the cabinet door is opened. A spring contactor 82 has also been provided so that an electrical contact is made automatically when the charging section assembly is slid into position within the cabinet and conversely the connection is automatically broken when the charging section assembly is removed.

When the cover 20 is removed from the power supply assembly 44, the arm 21 which is attached to the cover 20 will be removed from contact with the upper part of the actuating lever 11, thereby causing the lever 11 to pivot at the pivotal point 12 under the urging of the spring 14 to move the shorting spring 16 forwardly and into contact with a positive plate 25, thereby shorting the positive plates 25 with respect to the negative plates 24.

6

The forward movement of the lower portion of the actuating lever 11 also opens the interlock switch 22 to break the electrical connection between the power source 76 and the transformer 73.

An additional protective feature with respect to shorting the positive plates 25 of the collector section assembly 17 has been provided by means of the interlock cover 32, which as heretofore pointed out, is positioned on the inside of the side panel 31 and is effective to close the opening 33 of the side panel when the cabinet door 3 is closed. The interlock cover 32 is hinged in proximity to the lower edge of the side panel opening 33 and has two portions 35 extending through the side panel 31 which co-act with the cabinet door to move the interlock cover so as to close the panel opening 33 when the door is in a closed position and thus hold it away from contact with the collector plates 24 and 25 so as to prevent their being shorted when the door 3 is closed; however, when the cabinet door 3 is opened, gravity will cause the interlock cover 32 to be dropped downwardly and contact the plates 24 and 25 of the collector section, thereby shorting them and dissipating any charge on the plates. If the precipitator is not mounted vertically within the furnace duct, gravity will not necessarily be effective to cause the interlock cover 32 to drop into contact with the collector plates so as to short them; however, in order to remove the collector section assembly 17, a hand will be inserted in the opening 33 of the side panel 31, and when this is done, the interlock cover 32 is pushed into contact with the collector plates thereby shorting them.

With respect to the charging section assembly 44, it has been found that wires of comparatively light gauge are preferable in order to promote more effectively the ionization of the air passing through it. In order to protect these charging wires from possible damage when the charging section is handled, and also for the purpose of preventing their being damaged when the wires contract or expand during operation, flexibility has been provided by the use of the tension springs 52 as means for mounting them to the wire retaining tubes 49 and 50.

Further, with respect to the charging section assembly 44, it has been so designed that the assembling of the charging wires and the other components making up the charging section has been simplified. The wire retaining tubes 49 and 50, with their respective insulators 53 and 54 and the compression springs 56 positioned within the cylindrical recesses 55 of the insulators 53, may be readily mounted in their respective openings in the end negative plates of the charging section assembly 44 by pushing the insulators 53 against the compression springs 56 until the insulators 53 have moved far enough on the tubes 49 and 50 to permit the tubes 49 and 50 to be placed between the end negative plates of the charging section assembly 44 and slid into position in their respective openings in the end negative plates. When thus assembled into the openings, the compression springs 55 will firmly hold the wire retaining tubes in place. To complete the assembly, the charging wires with tension springs 52 mounted at their ends may then be hooked into the holes 51 of the wire retaining tubes 49 and 50 where they will be held under tension and retained in position.

It should also be pointed out that it is common practice to use rods as the negative elements in the charging section of a precipitator of this type, but we have found that more efficiency is obtained by the use of plates for this purpose, and particularly so when fine charging wires are used in combination with the negative plates, and we therefore deem this combination of fine charging wires and plates an important advantage.

In this connection, we have had good results using wires 46 of approximately .010 inch diameter with the spacing between the charging plates 45 being approximately three inches. The width of the individual plates 45 is not particularly critical but four inches width has been found satisfactory.

7

Other advantages of the precipitator are the compactness of the unit, the slidably removable charging and collector section assemblies making for convenience in cleaning, the automatic making and breaking of the electrical connections with the electrical circuit when the sections are respectively inserted or removed from the cabinet, and the safety feature with respect to the automatic shutting off of the power supply and the shorting of the collector plates when either the door of the cabinet or the cover of the power supply assembly is removed.

We wish it to be understood that our invention is not to be limited to the specific constructions and arrangements shown and described except only insofar as the claims may be so limited, as it will be understood to those skilled in the art that changes may be made without departing from the principles of the invention.

What is claimed is:

1. In an electrical precipitator having a cabinet with a door, a collector section within the said cabinet comprising alternately spaced positive and negative plates, a power supply connectible to a power source for charging the said plates positively and negatively respectively, a switch biased to an open position connected to said power supply, a means comprising a lever supported with respect to said cabinet carrying a laterally extending arm at its lower end, and a rod associated with the lever of the said cabinet door for causing the said lever to move when the said cabinet door is opened and thereby permit the said switch to open and shut off the power source and at the same time to cause the laterally extending arm to contact and short the said plates.

2. An electrical precipitator having a cabinet, a cabinet door, a power supply connectible to a power source, a housing for the power supply, a cover for the said housing, an arm attached to the inner face of the said cover, a collector section comprising alternately spaced positive and negative plates, the said negative plates being grounded to the said cabinet, a switch biased to an open position between the said power supply and source, a rod slidably supported with respect to the said cabinet, a lever pivotally attached to one end of the said rod and adapted to actuate the said switch, the said lever carrying a laterally extending member at its lower end, the said lever also having attached thereto a tension spring which is anchored with respect to the said cabinet and is effective to urge the said lever toward the said plates and away from the said switch, thereby permitting the said switch to open and shut off the power source and at the same time to bring the said laterally extending member into contact with one of the said positive plates to short the said positive and negative plates when either the said cabinet door or the said cover is opened with said arm pivoting respectively on the end of said arm and on said rod when said door and cover are removed.

3. An electrical precipitator having a cabinet, a cabinet door, a power supply assembly connectible to a power source, a power supply assembly cover, an arm attached to the inner face of the said power supply assembly cover, a collector section assembly comprising alternately spaced positive and negative plates, an electrical contactor connected with said power supply for making contact with one of said plates for charging said plates positively and negatively, a switch biased to an open position fixed with respect to the said cabinet and disposed between said source and supply, and means associated with the said switch and the said cabinet door and the said power supply assembly cover arm whereby the power supply is cut off and the said positive plates of the collector section assembly are shorted automatically with respect to the said negative plates when either the said cabinet door or the said power supply assembly cover is opened.

4. An electrical precipitator having a cabinet with a door, a power supply assembly attached to the back of the said cabinet, the said power supply assembly having a cover, a collector section assembly within the said cabinet

8

comprising alternately spaced positive and negative plates, the said power supply assembly connectible to a power source for charging the said plates positively and negatively, an actuated member under the control of the said cabinet door and also under the control of said cover so that when either the said door or the said cover is opened the actuated member both connects said positive and negative plates together for dissipating the charge thereon and disconnects the power source from the said power supply assembly.

5. An electrical precipitator having a cabinet with a door, a collector section assembly within the said cabinet comprising alternately spaced positive and negative plates, a power supply connectible to a power source for charging the said plates positively and negatively, a switch biased to an open position fixed with respect to the said cabinet and disposed between the said source and supply, a rod slidably supported within the said cabinet, a lever pivotally attached to one end of the said rod, a laterally extending arm fixed to the lower end of the said lever, a spring under tension fixed between the said lever and the said cabinet for urging the said lever forwardly toward said door when the said cabinet door is opened and thereby causing the said switch to open and the said arm to make contact with one of the said positive plates whereby the power source is disconnected from the said power supply and the said positive plates are grounded respectively.

6. An electrical precipitator having a cabinet, a cabinet door, a power supply connectible to a power source, a housing for the said power supply, a cover for the said housing, an arm attached to the inner part of the said cover, a collector section comprising alternately spaced positive and negative plates, a switch biased to an open position, a rod slidably supported with respect to the said cabinet, a lever pivotally attached to one end of the said rod carrying a laterally extending member at its lower end, the said lever being articulately associated at its upper end with the said arm, the said lever also having attached thereto a tension spring anchored with respect to the said cabinet, the said tension spring being effective to urge the said arm forwardly when either the said door or cover is opened and thereby causing the said open type switch to open and shut off the said power source and at the same time bring the said laterally extending member into contact with one of the said positive plates and thereby grounding the said positive plates.

7. An electrical precipitator having a cabinet, a charging section in the said cabinet, ionizing airborne particles passing therethrough, a door on the front of said cabinet, a collector assembly in the said cabinet for collecting the said ionized particles, a power supply on the rear of said cabinet, the said collector section and the said charging section being individual units and individually mounted on rails attached to the inside of said cabinet and being individually removable through the said door from the said cabinet, and a pair of spring connectors at the rear of said cabinet for respectively connecting the said charging section and the said collector section with the said power supply and being stressed to make electrical connections when the said charging section and the said collector section are moved into place in the said cabinet.

8. An electrical precipitator having a cabinet with a door, a collector section assembly within the said cabinet comprising alternately spaced positive and negative plates, a power supply connectible to a power source for charging the said plates positively and negatively respectively, the outermost plates being negative, the said outermost negative plates being fixed to panels at their respective ends, one of the said panels facing the said door of the cabinet and having an opening therein, the said opening having associated therewith a cover, the said cover being positioned on the inside of the said panel and pivotally mounted in proximity to the lower end of the said open-

ing in the said panel, and means associated with the said cabinet door for moving the said cover so as to close the said opening when the said door is closed, the said means permitting the said cover to drop downwardly under the influence of gravity when the said door is opened and thereby contacting the said electrically charged plates and shorting the said plates.

9. In an electrical precipitator having a collector section assembly comprising alternately spaced positive and negative plates, a power supply connectible to a power source for charging the said plates positively and negatively respectively, the outermost of said plates being fixed to panels at their respective ends, one of the said panels having a hand opening therein, and a cover hingedly mounted in the said panel, the said cover normally being in a closed position with respect to the said opening, the said cover being moved in the direction of and contacting the said plates so as to short them when a hand is inserted in the opening for removing the said collector section.

10. In an electrical precipitator having a cabinet, a power supply, a collector section, and a charging section which comprises a series of alternately spaced negative plates and positive charging wires, wire retaining tubes for carrying the said charging wires, the said charging wires having tension springs attached to their ends, the negative plates being connected at their respective ends to panels, the ends of the two end negative plates having irregular openings therein, insulators for supporting said wire retaining tubes, the said insulators having protrusions of a shape to conform to the shape of the said openings in the said ends of the said end negative plates, the said insulators being mounted in the said irregular openings, the said insulators having cylindrical recesses therein for receiving the said wire retaining tubes, the wire retaining tubes having spaced holes therein for mounting the said charging wires.

11. An electrical precipitator having a cabinet, a charging section in the said cabinet, ionizing airborne particles passing therethrough, a pair of rails mounted on the inside of the said cabinet, means associated with the said charging section for slidably positioning the said charging section on the said pair of rails within the said cabinet, a door on the said cabinet, a collector section in the said cabinet for collecting the said ionized particles, another pair of rails mounted within the said cabinet, means associated with the said collector section for slidably mounting the said collector assembly on the said second pair of rails within the said cabinet, the said collector section and the said charging section being individual units and individually removable through the said door from the said cabinet, a power supply carried by the said cabinet, and a pair of spring connectors for respectively connecting the said charging section and the said collector section with the said power supply and for stress to make an electrical connection with the said charging section and the said collector section when moved into place in the said cabinet.

12. A charging section for an electrostatic precipitator comprising a series of alternately spaced negative plates and positive charging wires; retaining tubes for carrying

said charging wires, said retaining tubes having slots at their ends, said negative plates being connected at their respective ends to panels, the ends of the two end negative plates having irregular openings therein; four insulators for carrying the said retaining tubes, the said insulators having protrusions of a shape to conform to the shape of the said openings in said end negative plates, the said insulators being mounted in the said irregular openings, the said insulators having cylindrical recesses therein for receiving the said retaining tubes, the said retaining tubes being mounted in the said cylindrical recesses, one each of said insulators which face each other when mounted having a key portion extending from the bottom of said recesses which match the said slots; and springs mounted in the other of said cylindrical recesses, for holding said retaining tubes under tension.

13. A charging section for an electrostatic precipitator comprising a series of alternately spaced negative plates and positive charging wires; retaining tubes for carrying said charging wires said retaining tubes having slots at their ends, the said charging wires having tension springs attached to their ends, the negative plates being connected at their respective ends to panels, the ends of the two end negative plates having irregular openings therein; four insulators for carrying said retaining tubes, the said insulators having protrusions of a shape to conform to the shape of the said openings in said end negative plates, the said insulators being mounted in the said irregular openings, the said insulators having cylindrical recesses therein for receiving the said retaining tubes, the said retaining tubes being mounted in the said cylindrical recesses, one each of said insulators which face each other when mounted having a key portion extending from the bottom of said recesses which match the said slots, the said retaining tubes having spaced holes therein for mounting the said charging wires; and springs mounted in the other of said cylindrical recesses for holding said retaining tubes under tension.

14. In an electrical precipitator having a cabinet with a door, a collector section assembly comprising alternately spaced positive and negative plates, a power supply connectible to a power source for charging the said plates positively and negatively respectively, the outermost of said plates being fixed to panels at their respective ends, one of said panels having an opening therein, and a cover for said opening hingedly mounted in the said panel, the said cover normally being in a closed position with respect to the said opening, the said cover contacting the said plates so as to short them when the said door is opened.

References Cited in the file of this patent

UNITED STATES PATENTS

55	2,129,783	Penney	Sept. 13, 1938
	2,427,740	Pegg	Sept. 23, 1947
	2,486,520	Dahlman	Nov. 1, 1949
	2,585,138	Landgraf	Feb. 12, 1952
	2,672,948	Penney	Mar. 23, 1954
60	2,780,305	Bonatz	Feb. 5, 1957