J. H. DERBY & E. S. CLAYTON.

THERMOSTATIC CIRCUIT CONTROLLING DEVICE.

APPLICATION FILED FEB. 8, 1918.

1,274,248. Patented July 30, 1918.

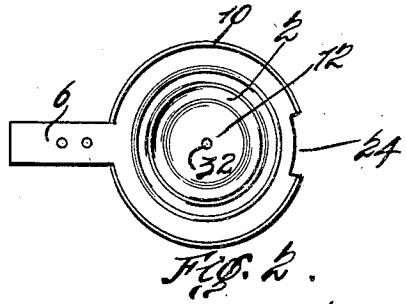


FIG. 2.

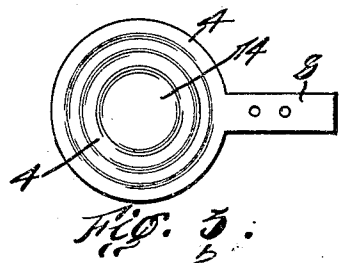


FIG. 3.

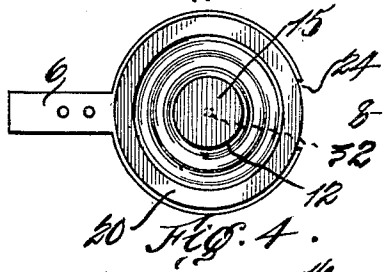


FIG. 4.

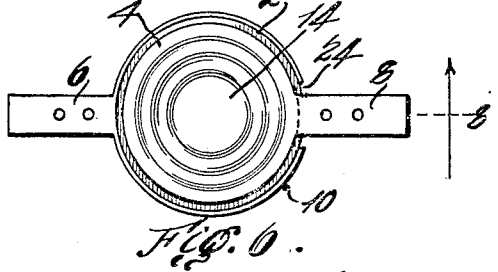


FIG. 6.

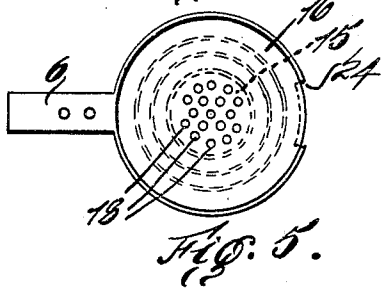


FIG. 5.

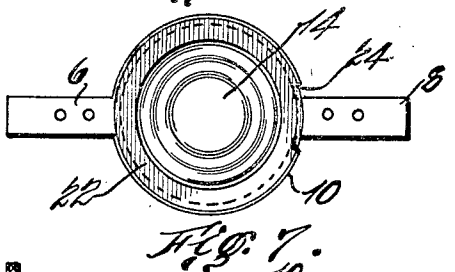


FIG. 7.

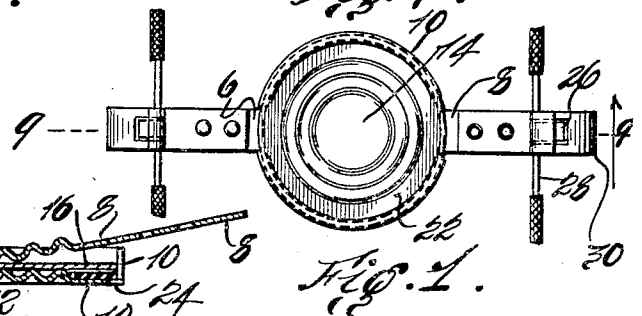


FIG. 1.

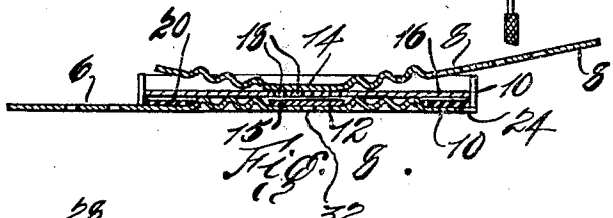


FIG. 8.

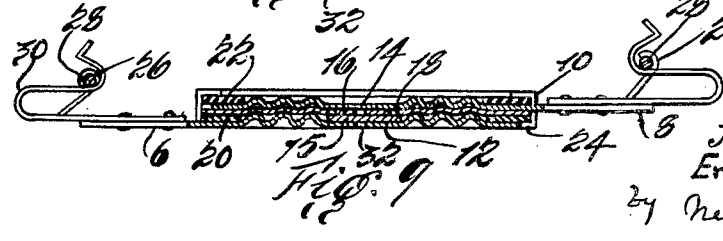


FIG. 9.

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UNITED STATES PATENT OFFICE.

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THERMOSTATIC CIRCUIT-CONTROLLING DEVICE.

1,274,248. Specification of Letters Patent. **Patented July 30, 1918.**

Continuation in part of application No. 114,203, filed August 10, 1916, and application No. 205,083, filed December 3, 1917. This application filed February 8, 1918. Serial No. 215,987.

To all whom it may concern:

Be it known that we, JOHN H. DERBY and ERNEST S. CLAYTON, citizens of the United States, both residing at New York city, New York, have invented certain new and useful Improvements in Thermostatic Circuit-Controlling Devices, of which the following is a clear, full, and exact description.

This invention relates to thermostatic circuit controlling devices and particularly to devices of the type employed to indicate marked rises in temperature as, for example, in fire alarm signal systems.

An object of the invention is to provide a light, inexpensive, easily constructed and easily installed thermostatic circuit controlling device which will be certain and accurate in operation even when left in exposed situations for long periods of time.

Another object of the invention is to provide a thermostatic circuit controlling device of the fusible circuit closer type which will be more sensitive to changes in temperature than devices of this type heretofore known and yet which is simpler in its construction and less liable to get out of order than such prior devices, and at the same time can be installed more easily and in a smaller space than devices heretofore known.

Other objects and important features of the invention will appear from the following description and claims when considered in connection with the accompanying drawings, in which—

Figure 1 illustrates one of the thermostats embodying the present invention located in bridging relation to a parallel fire-alarm circuit;

Fig. 2 is a plan view of one of the terminal disks forming a part of the device;

Fig. 3 is a plan view of the other terminal disk;

Fig. 4 shows the terminal disk of Fig. 2 with the fusible disk and one of the insulating rings in position;

Fig. 5 is a view similar to Fig. 4 but showing the insulating disk in position;

Fig. 6 shows the other terminal disk in position on the parts shown in Fig. 5;

Fig. 7 shows the disk centering insulating ring in position before the disk flange is turned over this ring to produce the structure illustrated in Fig. 1;

Fig. 8 is a section on the line 8—8 of Fig. 6; and

Fig. 9 is a section on the line 9—9 of Fig. 1.

Thermostatic circuit controlling devices of the fusible circuit closer type heretofore employed in fire-alarm installations usually involve a substantial base, requiring separate supporting attachment, and more or less mechanism, such, for example, as springs to insure the effective operation of the devices, these devices being usually so constructed that the fusible element of the device may be replaced. Because of the cost of the production of such devices, the labor required properly to install them and the liability to deterioration when unused for a long time, automatic fire-alarm signal systems have not been used so generally as is desirable in the interests of public safety. This has been particularly true in private residences.

A general object of this invention therefore is to produce a thermostatic circuit-controlling device particularly adapted for use in fire-alarm signal systems which will be so inexpensive and so easily installed that it will go into more general use than devices heretofore known and thus tend to reduce the annual fire loss.

In the illustrated embodiment of the invention not only are the foregoing objects attained, but a device has been produced which has proved to be more efficient than devices heretofore known, particularly by reason of the increased heat absorbing surface and its more compact construction, the latter feature preventing the radiation of the heat as in some of the prior devices.

In the illustrated construction, the casing which incloses the thermostatic circuit closing element proper is formed directly of the two circuit terminals, these terminals, in the illustrated construction, being formed as two disks 2 and 4, having integral arms 6 and 8 for connection to the circuit, the disk 4 being somewhat smaller in diameter than the disk 2 so that when laid upon the disk 2, as shown in Figs. 1, 6 and 7 of the drawings,

its peripheral edge will be spaced from the flange 10 upon the disk 2. The flange 10 is interrupted at the point where the arm 6 projects from the disk 2 and is also interrupted at a point opposite the arm 6 to receive the arm 8 of the disk 4.

Each of the terminal disks 2 and 4 preferably has annular corrugations pressed therein to increase the heat absorbing surface, and the disks also preferably have nesting central depressions 12 and 14, the depressions 12 being adapted to receive the disk of easily fusible material 15, which constitutes the circuit closing or terminal bridging element of the thermostatic circuit-controlling device. The opposed faces of the terminal disks 2 and 4 are insulated from each other, preferably by a thin disk 16 of varnished silk or other suitable insulating material perforated at 18 over the fusible disk 15, the disk 16 thus insulating the fusible disk also from the disk 4 but permitting the fusible material of the disk 14 to spread through the perforations 18 upon fusing, to bridge the terminals 2 and 4 and thus close or short circuit the fire-alarm circuit. The insulating disk 16 is preferably of such diameter that it fits closely within the space bounded by the flange 10 of the disk 2.

It will be noted that each of the disks 2 and 4 has a plane marginal portion outside the annular corrugations, the purpose of this marginal portion being to provide a flat clamping surface upon each disk, adapted to coöperate with the corresponding surface upon the other disk to insure a tight moisture and dust-proof joint about the edges when the disks are connected in the manner shown in Fig. 1 to form a closed casing. In order to maintain the insulating disk 16 substantially in one plane and to prevent injury to this disk by excessive pressure against the corrugations when the parts are clamped into their final relation, an annular insulating piece 20 is preferably located upon the plane marginal portion of the disk 2 in such position that it supports the margin of the disk 16, this annular piece 20 being preferably of such thickness that the disk 16 will rest against the upper edges of the corrugations in the disk 2, as shown in Fig. 9. The corrugations of the two disks 2 and 4 preferably register so that, as shown in Fig. 9, a slight corrugating of the material of the disk 16 will usually be effected by the clamping pressure exerted in clamping the parts into their final relation. This corrugating is preferably, however, not sufficient to cause liability of breaking of the material of the insulating disk 16.

The opposed faces of the disks 2 and 4 are insulated from each other by the insulating disk 16. The edge of the disk 4 is preferably insulated from the flange 10 of the disk 2 by an air gap, and in order therefore to insure maintenance of the edge of the disk 4 in spaced relation to the flange 10 of the disk 2, an annular insulating piece 22 is provided which has an outer diameter corresponding to the diameter of the space within the flange 10 and an inner diameter corresponding to the diameter of the outer corrugation of the series of corrugations on the disk 4. Thus when the disk 4 is laid upon the parts in the position shown in Fig. 6 and the insulating ring 22 is placed upon the parts shown in Fig. 6 in the manner shown in Fig. 7, the ring 22 will center the disk 4 in spaced relation to the flange 10 of the disk 2, as shown in dotted lines in Fig. 7. The ring 22 also insulates the overturned flange 10 of the disk 2 from the disk 4, as shown in Figs. 1 and 9. In order to insure the insulation of the arm 8 of the disk 4 from the disk 2 when the parts are clamped together in the manner shown in Fig. 1, the disk 2 is preferably cut back, as shown at 24, beneath the arm 8, so that bending of the arm 8 over the edge of the insulating ring 20 will not bring the arm 8 into close proximity to the edge of the disk 2.

The integral arms 6 and 8 may be attached to the circuit in any suitable manner. In the illustrated construction these arms are shown as provided with well-known clamping clips comprising a hook 26 adapted to hook over a bared portion of the wire 28 and a coöperating clamp member 30 having a slot through which the hook 26 projects, said clamp member 30 being formed of resilient material adapted to spring into wire clamping relation to the hook 26 when depressed sufficiently to permit the hook 26 to engage the wire.

In order to insure quick and positive operation of the thermostatic controlling device, it is important that the parts of the terminals to be bridged shall be as close together as possible, and, moreover, that they preferably exert a pressure upon the fusible material 14 to cause it to flow through the perforations 18 of the insulating disk 16 as soon as it begins to fuse. Moreover, it has been discovered that such pressure tends to lower the fusing point of the fusible material. To this end in the illustrated construction, the terminal disks 2 and 4 are preferably so tensioned, either before or during the clamping operation by which they are joined to form a closed casing, that the nesting central depressions of the two disks tend to clamp between them both the fusible disk 14 and the opposed portion of the insulating disk 16, having therein the perforation 18. One mode of obtaining this initial tension is shown in Fig. 8, in which the disk 4 is shown as cupped toward the disk 2. Thus, when the disks are clamped together to complete

the thermostatic circuit controlling device, the nesting central portions 12 and 14 of these disks will clamp between them the disk 15 and the opposed part of the disk 16, as shown in Fig. 9 of the drawings.

When one of these circuit controlling devices has operated to give a fire-alarm signal, it is usually important that the particular device which has operated be easily located in order that it may be replaced, and to this end provision is made for a visible indication of the device which has operated, this indication being given in the manner disclosed in our co-pending application Serial No. 114,203 filed August 10, 1916, for Letters Patent for thermostatic circuit controlling devices. A small hole 32 is located in the disk 2 beneath the fusible disk 15 in such position that a small bead of the fusible material will project through the hole 32 where it may be viewed from the outside when the heat has risen to such a point that one of these devices is operated to give the alarm signal.

The parts being assembled in the relation shown in Fig. 1 are preferably covered with some waterproofing material such, for example, as some of the standard waterproofing varnishes. This coating may be applied in any suitable manner as, for example, by dipping the device in the varnish.

From the foregoing description and from the illustration it will be seen that a very compact device of the character described has been provided, and that this device presents a much larger heat absorbing surface than devices of the class heretofore known, particularly since the device may be so supported, by reason of its lightness, that both faces may be exposed to the air. Moreover, the device is so inexpensive and so easily installed that it should contribute to the more extensive use of automatic fire alarms.

It will be noted that the fusible disk 15 is pressed directly against the most exposed face of the thermostat, the thin porous insulation being preferably upon the upper side of the disk, and that, moreover, the depression 14 of the upper terminal disk is pressed into close proximity to the fusible disk, being separated therefrom only by the thin perforated insulation, whereby heat may be conducted to the fusible disk from the upper side as well as from the lower side. The result of so exposing the fusible disk 15, under pressure, directly to the heat from the lower side, conducted through the thin portion 12 of the lower terminal disk, and substantially directly to heat from the upper side as well, this heat being supplemented by that conducted in from the sides and gathered by the corrugations, is that the illustrated thermostat is much more sensitive than any fusible solder thermostat ever before devised, and is much more certain and positive in operation.

This application as to common subject-matter is a continuation of our co-pending application Serial No. 205,083, filed December 3, 1917, for Letters Patent for improvements in thermally operated devices for electric circuits and of our co-pending application Serial No 133,203, filed August 10th, 1916, for Letters Patent for improvements in thermostatic circuit controlling devices.

What we claim as new is:—

1. In a device of the class described, the combination with a disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a casing formed of opposed circuit terminal disks confining said first-mentioned disks between the opposed faces under pressure.

2. In a device of the class described, the combination with a disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first-mentioned disks between the opposed faces under pressure, both of said terminal disks being exposed to the heat.

3. In a device of the class described, the combination with a disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first-mentioned disks between the opposed faces under pressure, one of said terminal disks being directly exposed to the heat and said fusible disk being in contact with said exposed disk.

4. In a device of the class described, the combination with a disk of fusible conducting material and a perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first mentioned disks between the opposed faces and so interlocked as to maintain said fusible disk under constant pressure.

5. In a device of the class described, the combination with a thin disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a casing comprising opposed thin, substantially flat circuit terminals between the opposed faces of which said first-mentioned disks are confined and pressed together, said terminals being interlocked at their edges and having surface dimensions relatively great compared with the thickness of the casing thus formed.

6. In a device of the class described, the combination with a thin disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a

casing comprising opposed thin, substantially flat circuit terminals between the opposed faces of which said first-mentioned disks are confined and pressed together, said terminals being interlocked at their edges and having surface dimensions relatively great compared with the thickness of the casing thus formed, and being provided with registering corrugations to increase both the strength and the heat-collecting surfaces of the structure.

7. In a device of the class described, the combination with a thin disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a casing comprising opposed thin, substantially flat circuit terminal disks, of surface areas considerably greater than the surface area of said fusible disk and between the opposed faces of which said first-mentioned disks are confined and pressed together, said terminal disks being interlocked and being corrugated in rings about the portions of their faces opposed to said fusible disk.

8. An electric circuit thermostat comprising opposed thin flat circuit terminals interlocked at their peripheral portions to form a closed casing, the opposed faces of said terminals being normally insulated from one another by a thin, flexible sheet of insulating material having perforations therethrough, a thin layer of easily fusible conducting material within said casing and separated from at least one of said circuit terminals by the perforated portion of said insulated material and adapted, when fused, to spread through said perforations to form an electrical connection between said circuit terminals.

9. An electric circuit thermostat, comprising opposed thin flat circuit terminals interlocked at their peripheral portions to form a closed casing, the opposed faces of said terminals being normally insulated from one another by a thin, flexible sheet of insulating material having perforations therethrough, one of said terminals being formed with a recess, a thin layer of easily fusible conducting material in said recess in contact with said terminal, said fusible material being separated from the other circuit terminal by the perforated portion of said insulating material and adapted, when fused, to spread through said perforations to form an electrical connection between said circuit terminals.

10. An electric circuit thermostat comprising opposed thin flat circuit terminals interlocked at their peripheral portions to form a closed casing, the opposed faces of said terminals being normally insulated from one another by a thin flexible sheet of insulating material having perforations therethrough, one of said terminals being formed with a centrally located recess, a thin layer of easily fusible conducting material in said recess in contact with said recessed terminal, said fusible material being separated from the other circuit terminal by the perforated portion of said insulating material, said latter circuit terminal having a central portion projecting toward the recessed portion of the opposed terminal, said terminals being so connected by their interlocking peripheral engagement that the central projecting portion of one terminal is tensioned to press toward the recessed portion of the opposed terminal upon the interposed fusible conducting material, whereby said easily fusible material when fused, will spread through the perforations of said insulating sheet to form an electrical connection between said circuit terminals.

11. An electric circuit thermostat, comprising opposed disk-shaped circuit terminals interlocked at their peripheral portions to form a closed casing, each terminal having an outwardly projecting arm portion to serve as a circuit connection, the opposed faces of said terminals being normally insulated from one another by a thin flexible sheet of insulating material having perforations therethrough, a thin layer of easily fusible conducting material separated from at least one of said terminals by the perforated portion of said insulating material and adapted, when fused, to spread through said perforations and form an electrical connection between said terminals.

12. An electric circuit thermostat, comprising opposed disk shaped circuit terminals interlocked at their peripheral portions to form a closed casing, each terminal having an outwardly projecting arm to serve as a circuit connection, the opposed faces of said terminals being normally insulated from one another by an intervening, thin, flexible sheet of insulating material having perforations therethrough, each of said disk shaped terminals having corrugations thereon to provide for one terminal a centrally located recess, a thin layer of easily fusible conducting material inclosed within said casing in said recess, the other terminal having a centrally located projecting portion and said easily fusible conducting material being separated from said latter terminal by the perforated portion of said insulating material, the circuit terminals being so connected by their interlocking peripheral engagement that the projecting portion of one is tensioned to press toward the recessed portion of the other upon said interposed easily fusible conducting material, whereby said fusible material, when melted, will spread through the perforations of said insulating sheet to form an electrical connection between said circuit terminals.

13. A thermostatic circuit controlling device, comprising terminal disks and a thin fusible disk located between said terminal disks, one of said terminal disks having a flange adapted to surround the other disk in spaced relation to the edge thereof, a thin insulating disk between the adjacent faces of said terminal disks and between said fusible disk and one of said terminal disks, said insulating disk having perforations through which said fusible disk may fuse to bridge said terminals, and marginal insulation centering and spacing said inner terminal disk from said flanged disk and over which said flange is turned into permanent disk-clamping position.

14. A thermostatic circuit controlling device, comprising terminal disks and a thin fusible disk located between said terminal disks, one of said terminal disks having a flange adapted to surround the other disk in spaced relation to the edge thereof, a thin insulating disk between the adjacent faces of said terminal disks and between said fusible disk and one of said terminal disks, said insulating disk having perforations through which said fusible disk may fuse to bridge said terminals, and marginal insulation centering and spacing said inner terminal disk from said flanged disk and over which said flange is turned into permanent disk-clamping position said disks being relatively tensioned to press said fusible disk and said insulating disk between their adjacent faces.

15. A thermostatic circuit controlling device, comprising opposed terminal disks presenting corrugated faces to the exterior, a thin fusible disk between said terminal disks, a thin insulating disk between the adjacent faces of said terminal disks and between said fusible disk and one of said terminal disks, and having perforations through which said fusible disk may fuse to bridge said terminals, and means for permanently uniting said disks comprising a flange upon one of said disks and an insulating ring over which said flange is turned into clamping relation to the other disk.

16. A thermostatic circuit controlling device, comprising opposed thin terminal disks having plane margins and having annular corrugations and nesting central depressions pressed therein, a thin fusible disk between said terminal disks in said central depression, a thin insulating disk separating the adjacent faces of said terminal disks and perforated over said central depression, an annular insulation supporting said insulating disk between said plane margins, and means for permanently clamping said disks together comprising a flange upon one disk surrounding and spaced from the edge of the other disk, an annular insulation cooperating with the corrugations of said last-mentioned disk to maintain the edge of said disk in spaced relation to the surrounding flange and over which insulation said flange is turned into disk-clamping position.

17. In a device of the class described, the combination with a disk of fusible conducting material and a perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first mentioned disks between the opposed faces, one of said disks having a centering projection and a centering and spacing insulating ring coöperating with said projection and over the edge of which the other disk is turned.

18. In a device of the class described, the combination with a disk of fusible conducting material and a perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first mentioned disks between the opposed faces, the edge of one disk being turned into interlocking relation to the edge of the other, an insulating ring between the marginal portions of the opposed faces of said disks, and a second insulating ring between the interlocked edges of said disks.

19. In a device of the class described, the combination with a disk of fusible conducting material and a perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first mentioned disks between the opposed faces, and a centering and spacing insulating ring bearing against the outer face of one of said disks and over which the edge of the other disk is turned to lock said disks together.

20. A thermostatic circuit-controlling device, comprising circuit terminals and an easily fusible conductor arranged to bridge said terminals, upon fusing, to close the circuit, said fusible conductor being entirely inclosed within said device and said device having provision for indicating when it has operated, comprising an opening of such size that a small portion of the fusible conductor can flow to the exterior to form an indicating bead.

21. In a device of the class described, the combination with a disk of fusible conducting material and a perforated insulating disk upon one side thereof, of a casing comprising opposed circuit terminal disks confining said first mentioned disks between the opposed faces and interlocked at their edges to inclose said fusible disk, one of said disks being provided with an opening of such size that a small portion of the fusible conductor can flow to the exterior of said casing and form an indicating bead when said device operates.

22. In a device of the class described, the

combination with a disk of fusible conducting material and a thin perforated insulating disk upon one side thereof, of a casing comprising opposed circuit-terminal disks between the opposed faces of which said first mentioned disks are confined under pressure, the disk contacting with the fusible disk being provided with an opening of such size that upon operation of the device a small bead of the fusible material will appear upon the exterior thereof.

Signed at New York city, N. Y., this 7th day of February, 1918.

JOHN H. DERBY.
ERNEST S. CLAYTON.

Corrections in Letters Patent No. 1,274,248.

It is hereby certified that in Letters Patent No. 1,274,248, granted July 30, 1918, upon the application of John H. Derby and Ernest S. Clayton, of New York, N. Y., for an improvement in "Thermostatic Circuit-Controlling Devices," errors appear in the printed specification requiring correction as follows: Page 2, line 124, for the word "perforation" read *perforations;* page 3, line 74, for "Serial No. 133,203" read *Serial No. 114,203;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of September, A. D., 1918.

[SEAL.]

F. W. H. CLAY,
Acting Commissioner of Patents.

Cl. 200—33.