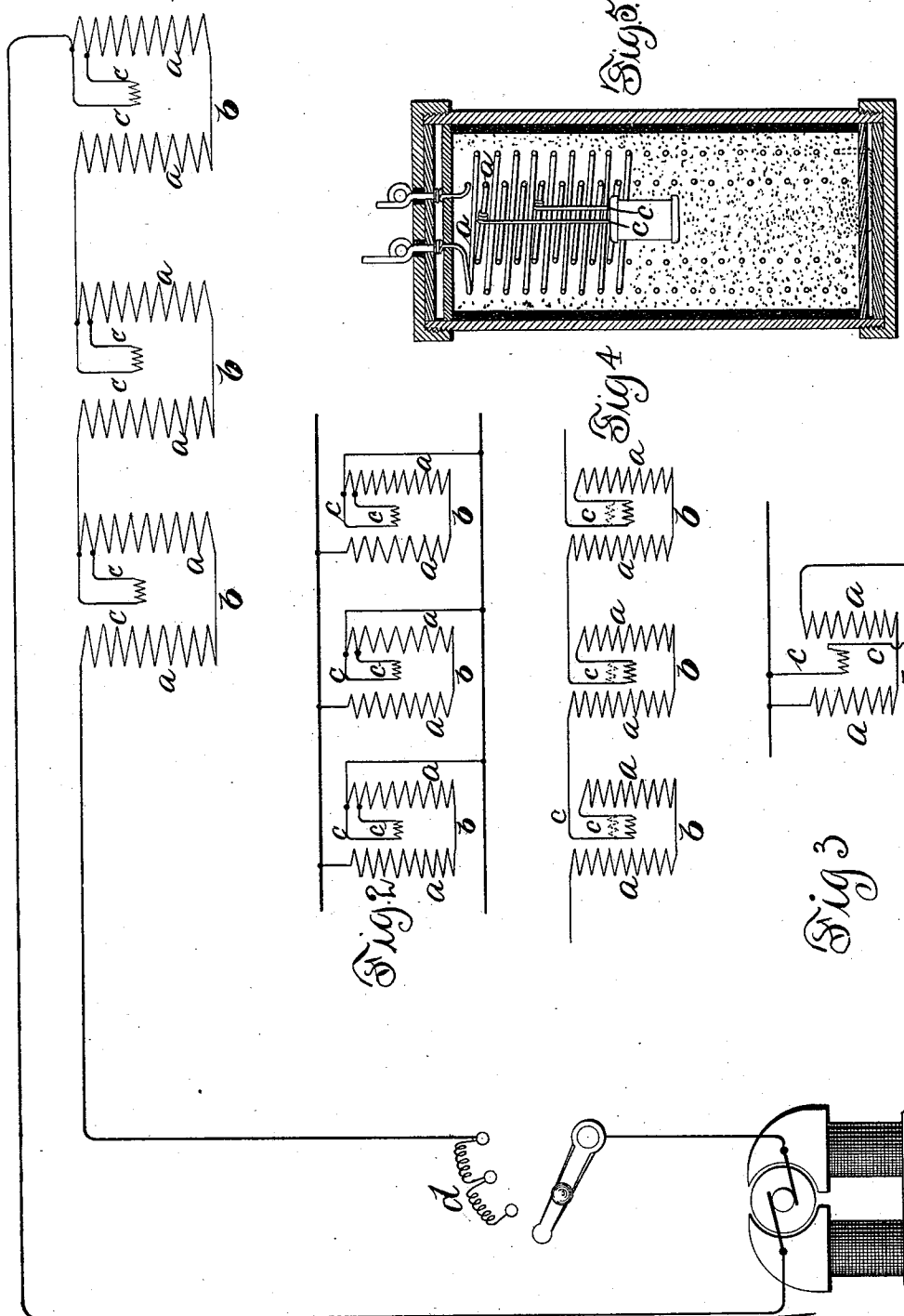
(No Model.)

C. H. RUDD.

ELECTRICAL DETONATOR.

No. 556,904. Patented Mar. 24, 1896.



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UNITED STATES PATENT OFFICE.

CHARLES H. RUDD, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

ELECTRICAL DETONATOR.

SPECIFICATION forming part of Letters Patent No. 556,904, dated March 24, 1896.

Application filed February 3, 1894. Serial No. 498,988. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. RUDD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electrical Detonators, (Case No. 35,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrical detonators; and its object is to effect the simultaneous firing of a number of cartridges by means of an electric current and to reduce to a minimum the necessary current-carrying conductors.

In an application, Serial No. 494,725, filed December 27, 1893, I have described an explosive cartridge adapted to be fired through the agency of electricity, the cartridge comprising an explosive material in which are embedded conductors of electricity, through which an electric current may be passed to raise the explosive material to a desired temperature, at which time an igniter is adapted to fire the explosive material. The igniter comprises as the igniting element a wire adapted to be heated by the passage of an electric current to such a degree of temperature that the surrounding material is fired by the heat received therefrom. In said application I provided three conductors extending to the cartridges for conveying the necessary heating and firing currents, one of the conductors being individual to the heating-coils, another to the igniting-conductors, while the third was common to the two. By the present invention I am enabled to dispense with one of the conductors, using only two conductors, which serve to carry both the heating and the igniting currents.

My invention in its preferred embodiment comprises heating and igniting conductors so connected and adjusted that when the heating-current is traversing the circuit the current through the igniting-conductors is insufficient to bring the same to the igniting-temperature, means being provided for increasing the strength of the current traversing the igniting-conductors when it is desired to fire the cartridges, thus causing them to rise in temperature to effect the firing of the explosive material. While I preferably secure the increase of current in the igniting-conductor by changing the strength of the total current, I may accomplish the flow of increased current through the igniting-conductor in other ways.

In an application, Serial No. 498,987, filed February 3, 1894, I have described means for producing explosions wherein the increased flow of current through the igniting-conductor is accomplished by a reversal of the current, and so far as such means are embraced by the claims herein said application is to be considered subsidiary hereto.

I will describe my invention in detail in connection with the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a number of cartridges connected in series after the manner of my invention, the igniting-conductors being located in parallel with portions of the heating-conductors. Fig. 2 is a similar view showing the several cartridges connected in multiple. Fig. 3 is a diagrammatic view showing the igniting-conductors and the heating-conductors connected in multiple. Fig. 4 is a diagrammatic view showing the igniting-conductors and the heating-conductors connected in series. Fig. 5 is a sectional view of a cartridge embodying my invention.

Like letters refer to like parts in the several figures.

As shown in Fig. 1, the heating-coils *a a* of the several cartridges *b b* are connected in series in an electric circuit. The igniting-conductors *c c* are placed in parallel with portions of the heating-conductors, the resistance of the igniting-conductor being such relatively to the portion of the heating-conductor in parallel therewith that when the normal heating-current is traversing the circuit the current shunted through the igniting-conductor will be insufficient to raise said conductor to the igniting temperature. When it is desired to effect the firing, the current is increased by cutting out the resistance *d*, which may remain in circuit during the heating process or the current may be increased in any of the other well-known ways, as by increasing the voltage of the dynamo.

In Fig. 2 the heating-conductors of the several cartridges are shown connected in multiple, the igniting-conductors, as before, being placed in parallel with portions of the heating-coils.

In Fig. 3 the igniting-conductor is placed in parallel with the whole heating-coil, the adjustment of resistance being such that the current diverted through the igniting-conductor during the heating process will be insufficient to raise the said conductor to the igniting temperature.

In Fig. 4 the igniting-conductors are connected in series with the heating-coils, the voltage between the terminals of the igniting-conductor being insufficient during the heating process to cause sufficient current to pass therethrough to heat the igniting-conductor to the igniting temperature. When the igniting-conductors are thus connected in series, I preferably employ auxiliary or current-carrying conductors in parallel with the igniting-conductors, as shown in dotted lines. The purpose of the current-carrying conductor is to convey current to the igniting-conductors later to ignite when one igniter shall have reached a fusing temperature in advance of the others; but as this feature forms the subject-matter of an application, Serial No. 498,986, filed February 3, 1894, I need not enter further into description.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with explosive material, of heating-coils and an igniting-conductor in a common electrical circuit, and means for passing the heating-current through the heating-coils and an igniting-current through the igniting-conductor; substantially as described.

2. The combination with explosive material, of heating-coils and an igniting-conductor in a common electrical circuit, and means for passing a heating-current through the circuit and subsequently increasing the strength of the current to ignite the igniting-conductor; substantially as described.

3. The combination with explosive material, of heating-coils, an igniting-conductor in parallel with a whole or a part of said heating-coils, and means for increasing the strength of the current flowing to ignite said igniting-conductor, after the explosive material has been heated by said heating-coils; substantially as described.

In witness whereof I hereunto subscribe my name this 26th day of January, A. D. 1894.

CHARLES H. RUDD.

Witnesses:
W. CLYDE JONES,
GEORGE L. CRAGG.