(No Model.) 2 Sheets—Sheet 1.

J. E. H. GORDON.

ELECTRIC LIGHTING.

No. 354,781. Patented Dec. 21, 1886.

Fig: 1.

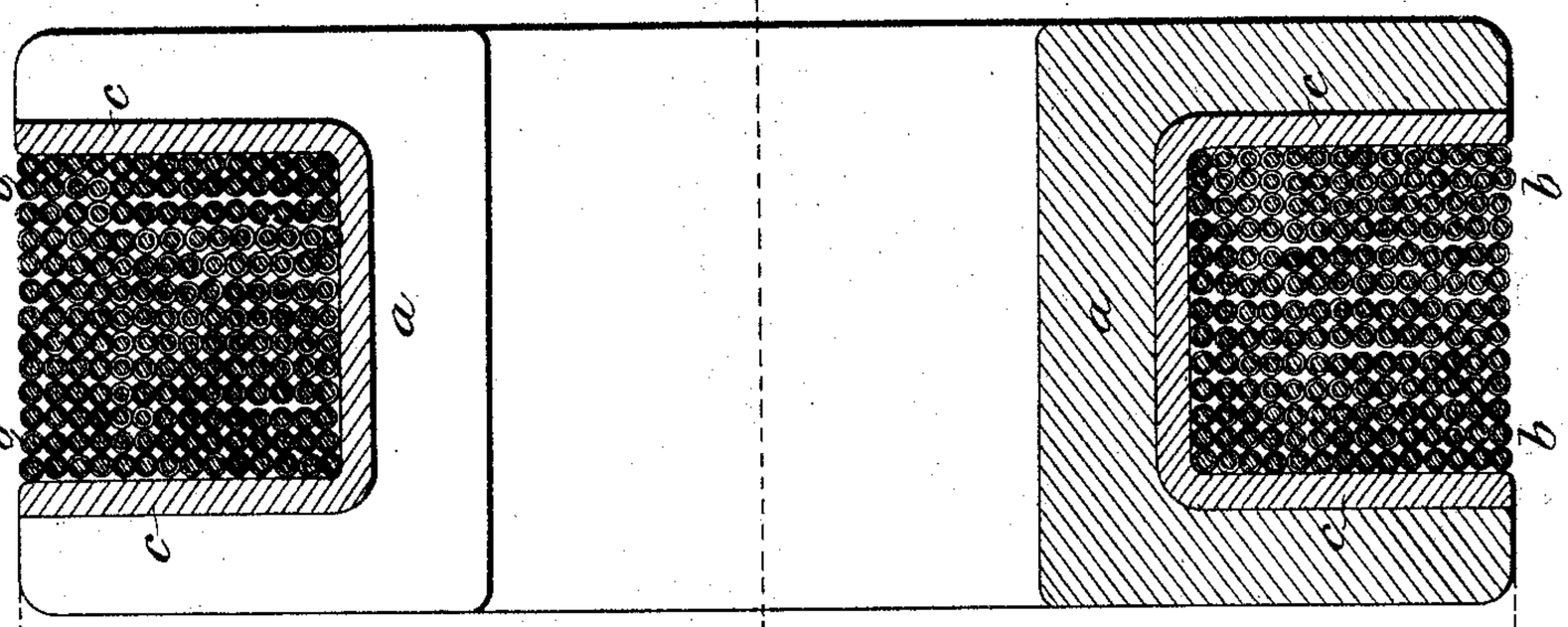
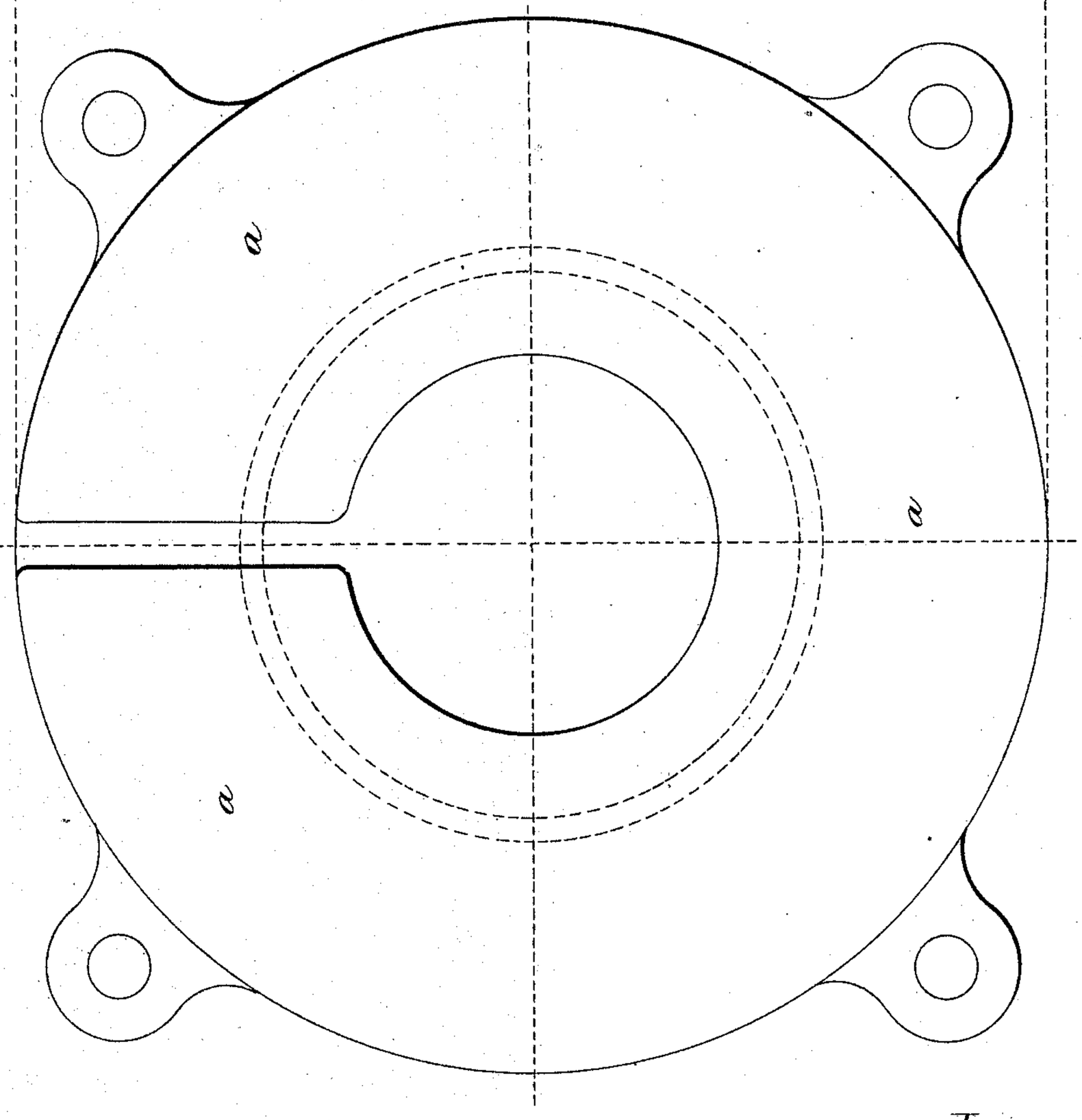


Fig: 2.



Witnesses.
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Walter DeLong

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(No Model.) 2 Sheets—Sheet 2.

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Fig: 3.

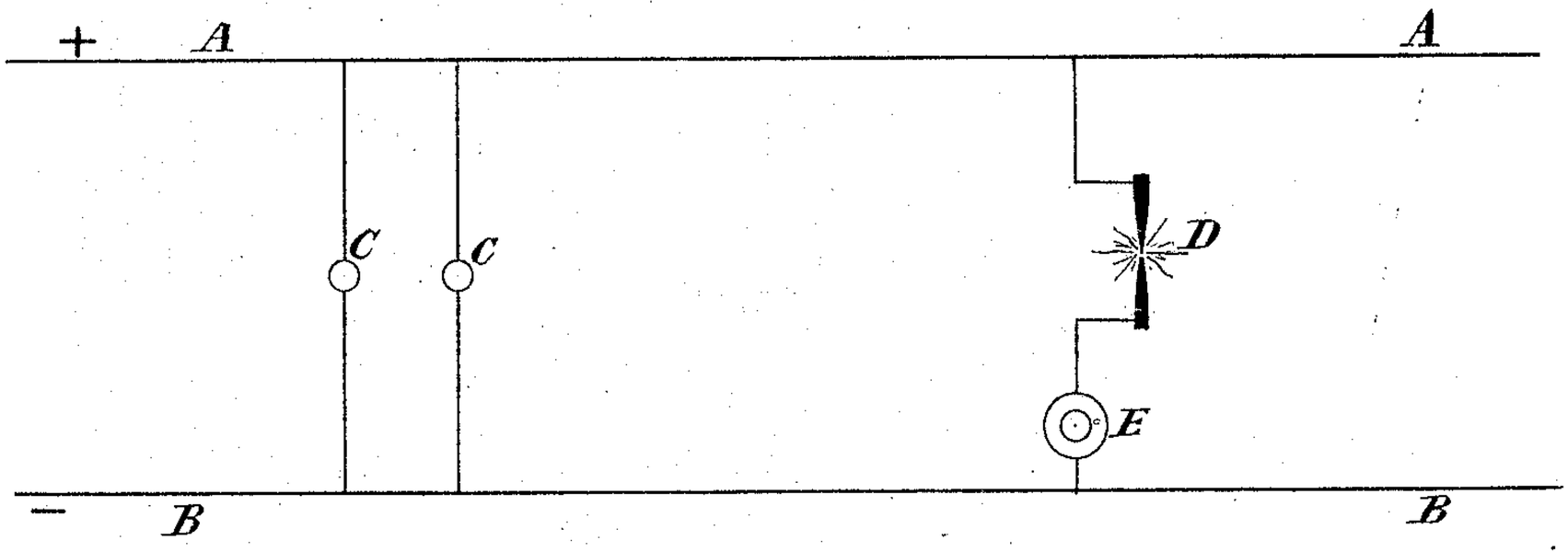
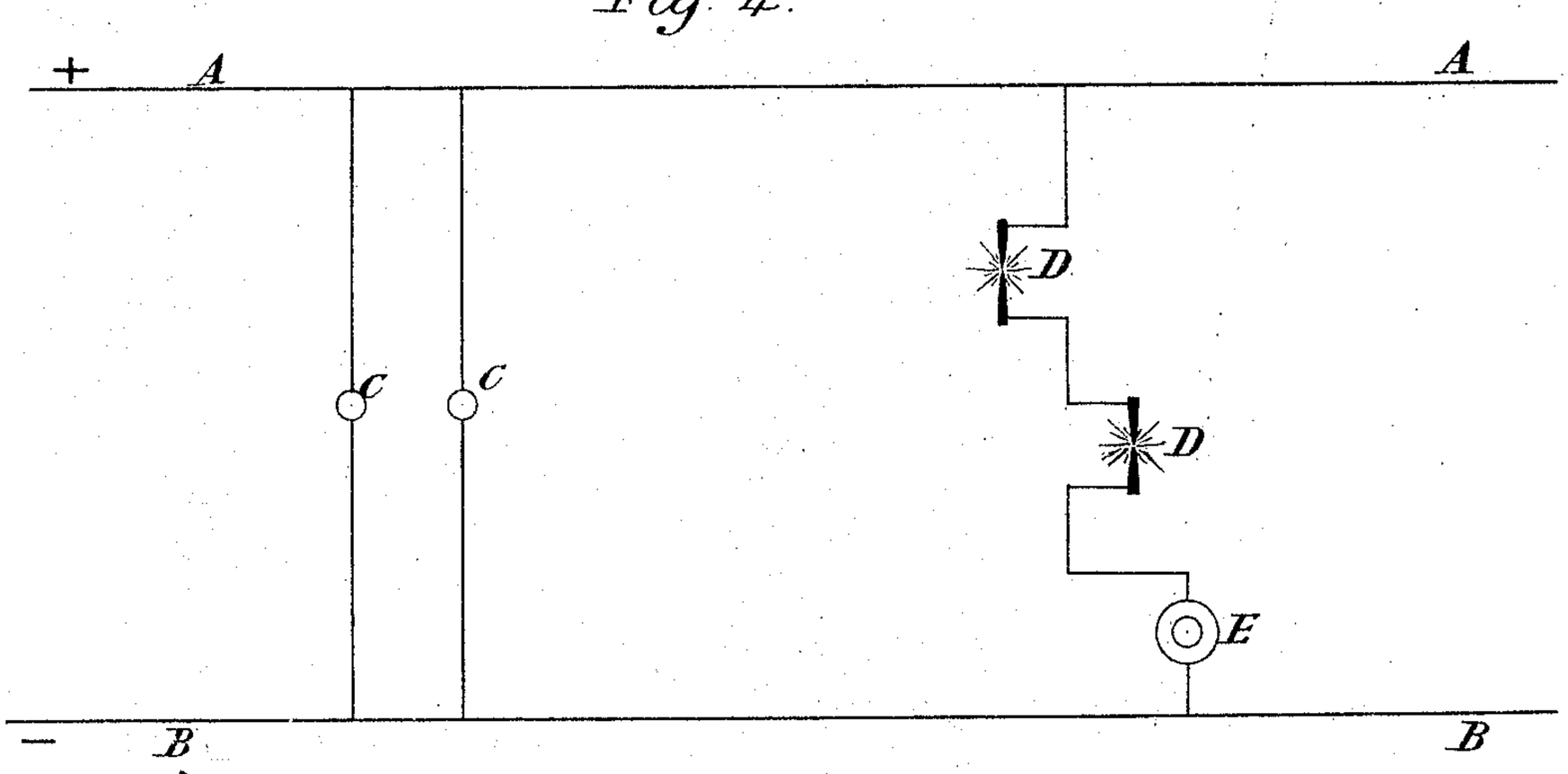


Fig: 4.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES E. H. GORDON, OF 28 COLLINGHAM PLACE, KENSINGTON, COUNTY OF MIDDLESEX, ENGLAND.

ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 354,781, dated December 21, 1886.

Application filed August 21, 1886. Serial No. 211,530. (No model.) Patented in England February 27, 1884, No. 4,042.

To all whom it may concern:

Be it known that I, JAMES EDWARD HENRY GORDON, a subject of the Queen of Great Britain, residing at 28 Collingham Place, Kensington, in the county of Middlesex, England, electrical engineer, have invented a certain new and useful Improvement in Electric Lighting, (for which I have received Letters Patent in Great Britain, No. 4,042, dated February 27, 1884,) of which the following is a specification.

This invention has for its object to provide improved means for enabling electric-arc lamps to be used advantageously in parallel circuit with one another or with incandescent lamps when they are fed with an alternating current. For this purpose I interpose in each of the parallel branch circuits, in which an arc lamp is placed, an inductive resistance-coil having a minimum of true resistance, so that the current will pass without material waste, and having a maximum coefficient of self-induction, so that if the resistance of the lamp be cut out—as, for instance, when the carbons of the lamp touch or approach too closely together—the amount of current which can then pass will rapidly reach a maximum of but moderate strength in excess of that previously required for the lamp.

I am aware that, broadly, the idea is not new, and that it has been proposed to connect in a branch circuit having an arc-lamp a self-inductive reactionary coil for a purpose similar to that above mentioned, and I therefore make no broad claim in this case to such subject-matter.

In illustration of my present invention I may state that with an inductive coil which I have used, and whose true resistance was three-tenths of an ohm, and using an alternating current with eighty-six volts electro-motive force, the current passing through the resistance and an arc lamp was sixteen ampères. On short-circuiting the lamp the current only increased to nineteen ampères, whereas with a non-inductive resistance of three-tenths ohm it would have risen to two hundred and eighty-six ampères.

The inductive resistance may be placed at the point where the branch to the arc lamp leaves the main, in which case it acts instead of a fusible cut-off in preventing undue heating of the branch wires if a short circuit should take place. This is an advantage, as it is well known that fusible cut-offs cannot conveniently be used with arc lamps.

In case the wires for several lamps branch from one point, care must be taken not to put the inductive resistances close together. They should be six or eight inches apart at least. If close, their mutual induction causes the lamps to flicker. The shape of the coil should be such that for a given quantity of wire—that is, for a given true resistance—the inductive resistance should be as great as possible—that is, so that with the desired inductive resistance the quantity of wire and the true resistance should be as small as possible. Professor Clerk Maxwell has shown (see Maxwell's Electricity 2d Ed. Vol. II, Sec. 706, p. 316) that "the coil of maximum self-induction" is a circular coil with the wire wound in a channel of square section the mean diameter of the coil—*i. e.*, the diameter at the center of the wire-channel—being three-sevenths times the side of the wire-channel.

Figure 1 of the drawings annexed shows a cross-section of such an inductive coil formed with a core of cast-iron. Fig. 2 is a side view of the same. Fig. 3 is a diagram view showing such inductive resistance-coils used in a system of electric lighting by arc-lamps in parallel circuit with one another or with incandescent lamps. Fig. 4 is a similar diagram view showing two arc lamps in each branch circuit.

In Figs. 1 and 2, *a* is the cast-iron core, which forms the bobbin on which the coils of insulated wire *b* are wound. The core is hollow in the center, and is slit to stop the circulation of currents in the iron. One of the flanges is made with lugs extending from it to enable the coil to be fixed to a wall. The inner sides of the square channel may be covered with a layer, *c*, of asbestus, to protect the wire from the heat generated in the iron. An inductive resistance such as shown in the drawings is of a size suitable for being used with arc lamps fed with a current of a strength, say, from fifteen to twenty ampères, with one hundred volts on the main. If the core *a* be of wood,

then the whole inductive coil has to be made of larger dimensions, so as to allow of about three times as much wire (by weight) being used.

In the diagrams, Figs. 3 and 4, A is a positive, and B a negative, main or conductor. C are incandescent lamps, and D arc lamps in parallel circuits. E are inductive resistance-coils of the nature hereinbefore described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare what I claim is—

In a system of electric lighting in which the arc lamps are arranged in parallel circuit with one another or with incandescent lamps, the combination, with the circuits and lamps, of an inductive resistance-coil in each arc-lamp branch, the insulated wire coil of which is circular and is wound in a channel of square section, or approximately so, the diameter of the coil at the center of the wire-channel being three-sevenths times the side of the wire-channel, or thereabout.

J. E. H. GORDON.

Witnesses:
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WALTER J. SKERTEN.