

No. 748,350.

PATENTED DEC. 29, 1903.

E. A. DAVIES.  
APPARATUS FOR GALVANIZING METAL SHEETS.

APPLICATION FILED FEB. 18, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

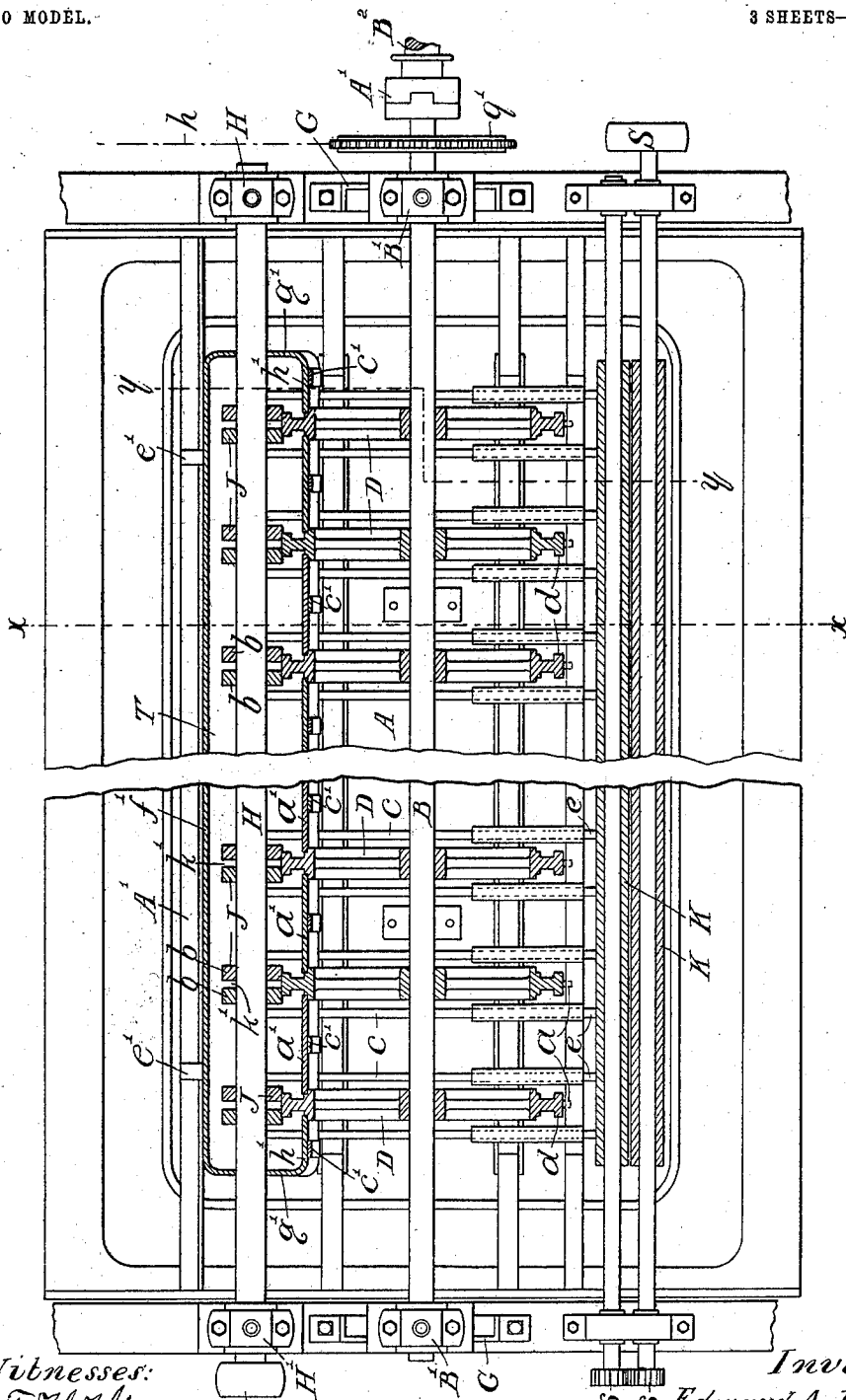


Fig. 1.

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Inventor:

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*Henry Cornell*  
Attorney

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3 SHEETS—SHEET 2.

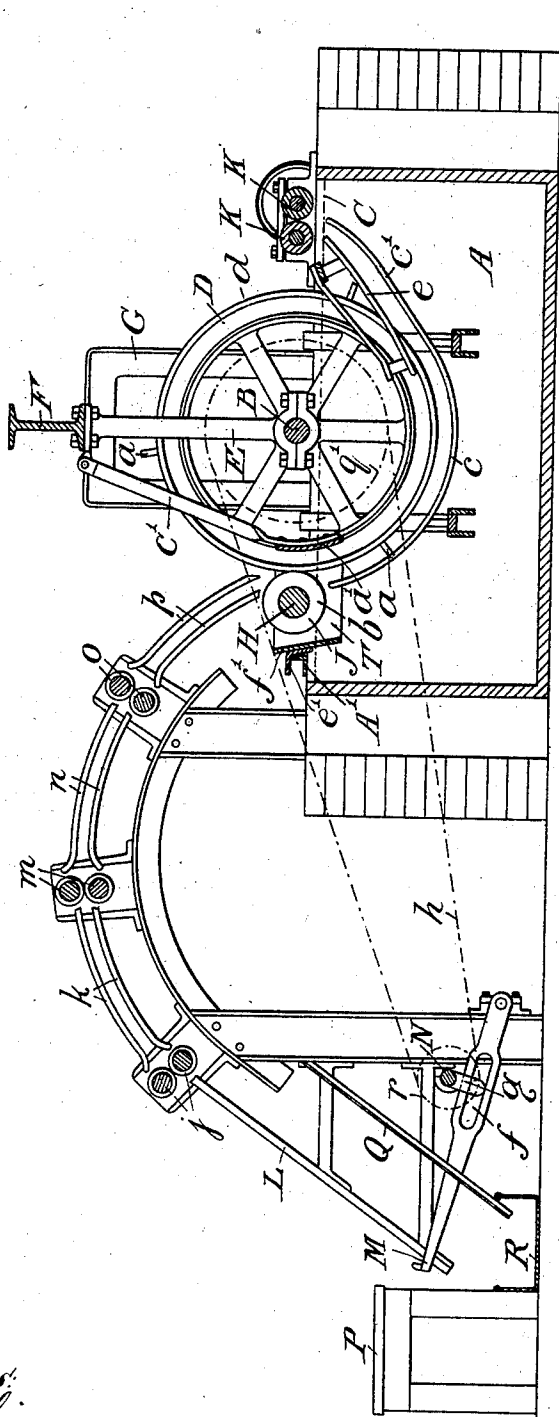


Fig. 2.

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3 SHEETS—SHEET 3.

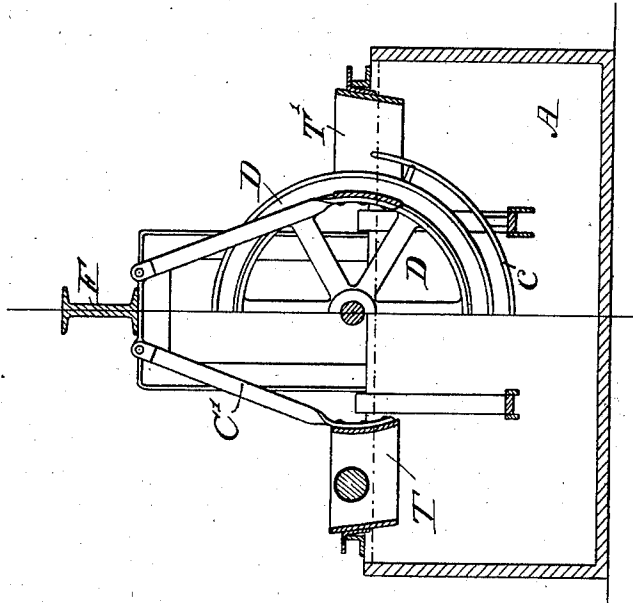


Fig. 5.

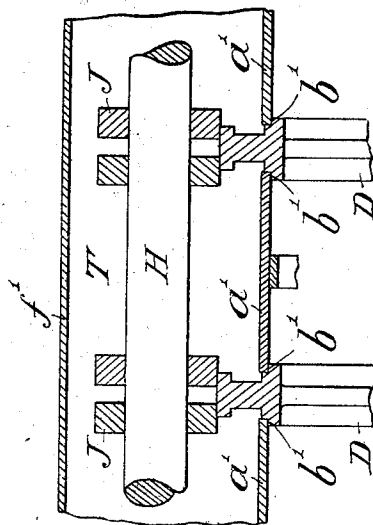


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR GALVANIZING METAL SHEETS.

SPECIFICATION forming part of Letters Patent No. 748,350, dated December 29, 1903.

Application filed February 18, 1903. Serial No. 144,002. (No model.)

### *To all whom it may concern:*

Be it known that I, EDWARD ALBERT DAVIES, a subject of the King of Great Britain, residing at Wolverhampton, in the county of Stafford, England, have invented certain new and useful Improvements in Apparatus for Use in Galvanizing Metal Sheets, of which the following is a specification.

This invention has for its object novel or improved apparatus for use in galvanizing metal sheets for the purpose of enabling such sheets to be passed sidewise through the bath of spelter, whereby a larger number of sheets may be passed through the bath in a given time than in the ordinary method of galvanizing by passing the sheets endwise through the bath.

The invention is illustrated by the drawings herewith, of which—

Figure 1 is a plan of the galvanizing-bath and a sectional plan of apparatus used therewith for carrying the sheets into, through, and out from the molten metal. Fig. 2 is a section, taken on line *xx* of Fig. 1, through the bath and through the apparatus for carrying the sheets into, through, and out from the molten metal and also a sectional view of the means by which the sheets are fed to the apparatus by which they are drawn down into the molten metal. Fig. 3 is a transverse section through the bath, taken on the zigzag or irregular line *yy* of Fig. 1, but shows a modification of the apparatus used therewith, which is adopted when the sheets are to be brought out from the bath by hand, as is sometimes desired; and Fig. 4 is a sectional plan view, to an enlarged scale, of certain details.

Referring first to Figs. 1 and 2, A is the galvanizing-bath containing the molten "spelter." The width of a galvanizing-bath is measured in a direction at right angles to that of the travel of the sheets. This width in the case of the bath A is somewhat greater than the length of the sheets to be coated. A shaft B passes over the whole width of the bath and is journaled in bearings B' at opposite sides of the bath. This shaft is preferably clear above the top of the molten metal in the bath, the upper surface of which is in-

dicated by the broken line C. The shaft B has fixed thereon a number of wheels D, each of which has a plain cylindrical periphery *d*, except for outwardly-projecting fingers *a*, spaced apart therearound at intervals, each somewhat greater than the width of a sheet to be galvanized. These fingers are preferably as small in diameter as is consistent with their required strength. The shaft B is supported at intervals along its length by means of hangers E from an overhead girder F, supported on standards G at opposite sides of the bath. A shaft H, which is parallel with the shaft B, runs over the whole width of the bath at the sides of the wheels D, which are toward the feeding-in side of the bath, and is journaled in bearings H', which are fixed at opposite sides of the bath. This shaft also is preferably clear above the surface of the molten metal in the bath. Upon the shaft H are fixed a number of rolls J, which are in positions thereupon, respectively, opposite to the wheels D, and the peripheries of these rolls J bear against or are close to the peripheries of the wheels D. Each roll J is formed with a groove therearound, which will admit of the passage therethrough of the fingers *a* of the corresponding wheel, and to avoid unnecessarily large diameter each roll is formed of two separate disks *b*, which are spaced apart upon the shaft H a distance to leave between them a clearance-space *k* for the passage of the fingers of the corresponding wheel. The wheels D are immersed, as shown, for a considerable depth in the molten metal.

KK are a pair of drawing-out rolls and are of the character of the drawing-out rolls described in United States Patent No. 471,065, granted to Moses Bayliss, March 15, 1892.

*c* represents a number of curved guides, which are fixed within the bath in positions to guide the sheets as they travel through the bath between themselves and the peripheries of the wheels D, and the delivery ends *c'* of these guides are shaped as shown and, together with upper delivery guides *e*, guide the sheets into the drawing-out rolls.

The sheets are presented sidewise to enter between the rolls J and the peripheries of the wheels D and are carried down thereby into

the molten metal and are guided through such metal between the guides *c* and the wheels D, and immediately the rear side of a sheet has passed from between the rolls J and wheels D and the sheet can no longer be fed forward thereby one of the fingers *a* of each wheel D comes against such edge of the sheet and carries the sheet forward until its leading edge is passed up between the guides *e* and *c'* and is caught between the rolls K. The sheet is then drawn out from the bath by the rolls K. The shaft B may be driven through the medium of a clutch A' from a shaft B<sup>2</sup>, which is driven from any source of power, and the shaft H may be driven through the medium of a pulley D', fixed thereon from any revolving shaft.

The sheets might be fed by hand to the apparatus for carrying them through the bath; but this would involve considerable risk of spoiling many of the sheets. They are, therefore, fed to such apparatus by means corresponding to those which have been previously used for feeding sheets to the drawing-in rolls of a galvanizing-bath. These means comprise inclined guides L, Fig. 2, up which the sheets are moved one by one by means of arms M, which are vibrated in vertical planes through the medium of cranks *g* of a rotating shaft N, which operates within slots *f* of the arms. The sheets are fed by the arms M between rolls *j*, which carry them forward between guides *k* into rolls *m*, by which they are carried forward between guides *n* into rolls *o*, from whence they pass between guides *p* to the apparatus by which they are drawn into the molten metal. The sheets which are ready for galvanizing are laid one upon another upon a stool or bench P, from which they are removed one by one to the arms M. Any water left upon the sheets after the washing subsequent to the pickling process drops down an inclined sheet or plate Q into a trough R. The rolls *j* are rubber-coated, as is usual, for the purpose of squeezing the water from the surfaces of the sheets. The shaft N is necessarily driven in a manner to insure that its movement will synchronize with that of the shaft B, and for this purpose it is convenient to gear the shaft B with the shaft N by a pitched chain *h*, passing around a sprocket-wheel *q'* on the shaft B and a sprocket-wheel *r* on the shaft N. The rolls of each pair of rolls *j*, *m*, and *o*, respectively, are geared together in the ordinary manner, and each of these pairs of rolls may be driven by a belt or in any desired manner. The drawing-out rolls K are geared together by pinions *s* in the usual manner and may be driven through the medium of a belt-pulley S. It is preferred to run these rolls at a speed which will draw out the sheets rather faster than they are fed in, thus clearing each sheet away quickly from the front of the sheet following it. As the long edges of the sheets are liable to be somewhat wavy, each sheet may be fed into

the bath slightly skew-wise—say to the extent of about three inches in the total length of the sheet—thus insuring that one corner will be first presented to be caught between the rolls K, and thereby facilitating the entrance of the entire leading edge of the sheet between such rolls.

The flux-box T, which contains the flux floating upon the top of the molten metal and through which it is necessary to pass the sheets as they enter the bath, is formed to allow the peripheries of the wheels D to project thereinto, the main length of the inner side of the flux-box consisting for such purpose of a number of plates *a'* to form portions of such side which are between the wheels. A short length of the flux-box, with the rims of two of the wheels projecting thereinto, is shown to an enlarged scale by Fig. 4. Around each side of the rim of each wheel is turned a rabbet *b'* and each end of each plate *a'* beds within a corresponding rabbet. Each plate is held up by means of an arm C', which is pivotally connected at its upper end with the girder F and is fixed at its lower end to the plate. The pivot-center of the arm is considerably inward from the plate in a direction toward the vertical axis of the shaft B, and thus the weight of the plate and arm tends to keep the plate pressing back sufficiently against the cylindrical surface of the corresponding rabbets to maintain a sufficiently fluid-tight joint to retain the flux in the box T. The plates *a'* are curved, as seen in vertical section, to the same curve as the cylindrical surfaces against which they bear and bear against such surfaces throughout the whole depth of the plates. The outer side *f'* of the flux-box T has brackets *e'*, which rests upon a supporting-bar A', which itself rests upon the walls at opposite sides of the bath, and this side of the box is formed rigid with the ends *g'* and with portions *h'* of the inner side of the box, which are between the ends *g'* and the outer wheels D. The portions *h'* of the box are suspended by pivoted arms C' exactly as in the case of the plates *a'*, and the edges of the inner ends of the portions *h'* fit within rabbets corresponding to the rabbets *b'*, turned around the outer wheels, and bed against the cylindrical surfaces thereof.

Referring now to Fig. 3, the apparatus is shown with the guides arranged for delivering the sheets through a box T' instead of through drawing-out rolls, the sheets being in such case taken out by the attendant by means of a pair of tongs. In this case the guides *c* are concentric with the wheels D right up to the delivery ends of the guides. The box T' is constructed as the flux-box T, already described, and is supported in the same manner.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In apparatus for use in galvanizing metal sheets, the combination, with the bath con-

taining the molten galvanizing metal, of a plurality of narrow rings rotative about a common axis and the lower portions of which are immersed in the molten metal, a plurality of rolls opposite and adjacent to the respective rings and having a common axis which is parallel with the axis of said rings and is at the feeding-in side of said rings, and between and by which rings and rolls the sheets to be galvanized are successively carried down into the molten metal, substantially as set forth.

2. In apparatus for use in galvanizing metal sheets, the combination, with the bath containing the molten galvanizing metal, of a plurality of rings rotative about a common axis and the lower portions of which are immersed in the molten metal, rolls having a common axis which is parallel with the axis of said rings and is at the feeding-in side of said rings, and between and by which rings and rolls the sheets to be galvanized are successively carried down into the molten metal, fingers projecting outward from said rings, and fixed guides within said bath between which and the lower sides of said rings the sheets are first passed forward through the molten metal by the combined action of said rings and rolls and are subsequently carried forward by said fingers to bring their forward edges out through the surface of the molten metal at the delivery side of the bath, substantially as set forth.

3. In apparatus for use in galvanizing metal sheets, the combination with the bath containing the molten galvanizing metal, of a plurality of rings rotative about a common axis and the lower portions of which are immersed in the molten metal, rolls having a common axis which is parallel with the axis of said rings and is at the feeding-in side of said rings, and between and by which rings and rolls the sheets to be galvanized are successively carried down into the molten metal, fingers projecting outward from said rings, fixed lower guides within said bath between which and the lower sides of said rings the sheets are first passed forward through the molten metal by the combined action of said rings and rolls, fixed upper guides within said bath between which and said lower guides the sheets are carried forward by said fingers to bring their forward edges out through the surface of the molten metal at the delivery side of the bath, and a pair of rolls above the surface of the molten metal at the delivery side of the bath into which the sheets are delivered by said fingers and which themselves draw out the sheets from the bath, substantially as set forth.

4. In apparatus for use in galvanizing metal sheets, the combination, with the bath containing the molten galvanizing metal, of a plurality of rings rotative about a common axis and the lower portions of which are immersed in the molten metal, rolls having a common axis which is parallel with the axis of said rings and is at the feeding-in side of

said rings and between and by which rings and rolls the sheets to be galvanized are successively carried down into the molten metal, fingers projecting outward from said rings, which subsequently carry the sheets forward to bring their forward edges out through the surface of the molten metal at the delivery side of the bath, and clearance-openings in said rolls for the passage of the fingers, substantially as set forth.

5. In apparatus for use in galvanizing metal sheets, the combination, with the bath containing the molten galvanizing metal, of a plurality of rings rotative about a common axis, the outer peripheries of said rings passing through a flux-box arranged within said bath and the lower portions of the rings immersed in the molten metal, and rolls having a common axis which is parallel with the axis of said rings and is at the feeding-in side of said rings, and between and by which rings and rolls the sheets to be galvanized are successively carried down into the molten metal, substantially as set forth.

6. In apparatus for use in galvanizing metal sheets, the combination with a bath containing the molten galvanizing metal, of a plurality of rings, rotative about a common axis, the outer peripheries of said rings passing through the flux-box arranged within said bath and the lower portions of the rings immersed in the molten metal and fingers projecting from said rings, which are utilized in carrying the sheets through the bath, substantially as set forth.

7. In apparatus for use in galvanizing metal sheets the combination, with the bath containing the molten galvanizing metal, of a plurality of wheels mounted upon a rotating shaft which passes across the width of the bath, the outer peripheries of said wheels passing through a flux-box arranged within the bath, said flux-box having its inner side formed with lengths which pass, respectively, between the rims of adjacent wheels and bear against turned surfaces thereof which are nearer to the axis of the wheels than the outer peripheries thereof, and means whereby the said wheels are utilized in carrying down the sheets successively into the molten metal, substantially as set forth.

8. In apparatus for use in galvanizing metal sheets, the combination, with the bath containing the molten galvanizing metal, of a plurality of wheels mounted upon a rotating shaft which passes across the width of the bath, the outer peripheries of said wheels passing through a flux-box arranged within the bath, said flux-box having its inner side formed with lengths which pass, respectively, between the rims of adjacent wheels and bear against turned surfaces thereof which are nearer to the axis of the wheels than the outer peripheries thereof, and rolls between and by which and the wheels the sheets to be galvanized are successively carried down into the molten metal, substantially as set forth.

9. In apparatus for use in galvanizing metal sheets the combination, with the bath containing the molten galvanizing metal, of a plurality of wheels mounted upon a rotating shaft which passes across the width of the bath, the outer peripheries of said wheels passing through a flux-box arranged within the bath, said flux-box having its inner side formed with lengths which pass, respectively, between the rims of adjacent wheels and bear against turned surfaces thereof which are nearer to the axis of the wheels than the outer peripheries of the wheels and having the portions of its inner side which are beyond the two outer wheels arranged with their edges which are adjacent to said outer wheels bearing also against turned surfaces of such wheels which are nearer to the axis of the wheels than to the outer peripheries thereof, and means by which said wheels are utilized in carrying down the sheets successively into the molten metal, substantially as set forth.

10. In apparatus for use in galvanizing metal sheets the combination, with the bath containing the molten galvanizing metal, of a plurality of wheels mounted upon a rotating shaft which passes across the width of the bath, the outer peripheries of said wheels passing through a flux-box arranged within the bath, said flux-box having its inner side formed with lengths which pass, respectively, between the rims of adjacent wheels and bear against turned surfaces thereof which are nearer to the axis of the wheels than the outer peripheries of the wheels and having the portions of its inner side which are beyond the two outer wheels arranged with their edges which are adjacent to said outer wheels bearing also against turned surfaces of such wheels which are nearer to the axis of the wheels than to the outer peripheries thereof, and rolls between and by which and the wheels the sheets to be galvanized are successively carried down into the molten metal, substantially as set forth.

11. In apparatus for use in galvanizing metal sheets, the combination, with the bath containing the molten galvanizing metal, of a plural-

ity of wheels mounted upon a rotating shaft, which passes across the width of the bath, the outer peripheries of said wheels passing through a flux-box arranged within the bath and the inner side of the flux-box formed with portions which bear at their edges against turned surfaces of the wheels which are nearer to the axis of the wheels than to the outer peripheries thereof, said portions of the flux-box being suspended each from an axis which is above but not vertically over the corresponding portion of the box, whereby the gravity of such portion of the box is utilized in maintaining its pressure against turned surfaces of the wheels, and means by which said wheels are utilized in carrying down the sheets successively into the molten metal, substantially as set forth.

12. In apparatus for use in galvanizing metal sheets, the combination, with the bath containing the molten galvanizing metal, of a plurality of wheels mounted upon a rotating shaft which passes across the width of the bath, the outer peripheries of said wheels passing through a flux-box arranged within the bath and the inner side of the flux-box formed with portions which bear at their edges against turned surfaces of the wheels which are nearer to the axis of the wheels than to the outer peripheries thereof, said portions of the flux-box being suspended each from an axis which is above but not vertically over the corresponding portion of the box, whereby the gravity of such portion of the box is utilized in maintaining its pressure against turned surfaces of the wheels, and rolls between and by which and the wheels the sheets to be galvanized are successively carried down into the molten metal, substantially as set forth.

In witness whereof I have hereunto signed my name, this 4th day of February, 1903, in the presence of two subscribing witnesses.

EDWARD ALBERT DAVIES.

Witnesses:

ROBERT G. GROVES,  
ALFRED H. WATKINS.