(No Model.) 2 Sheets—Sheet 1.

H. ROBERTS.

COATING METALS WITH ZINC.

No. 262,124. Patented Aug. 1, 1882.

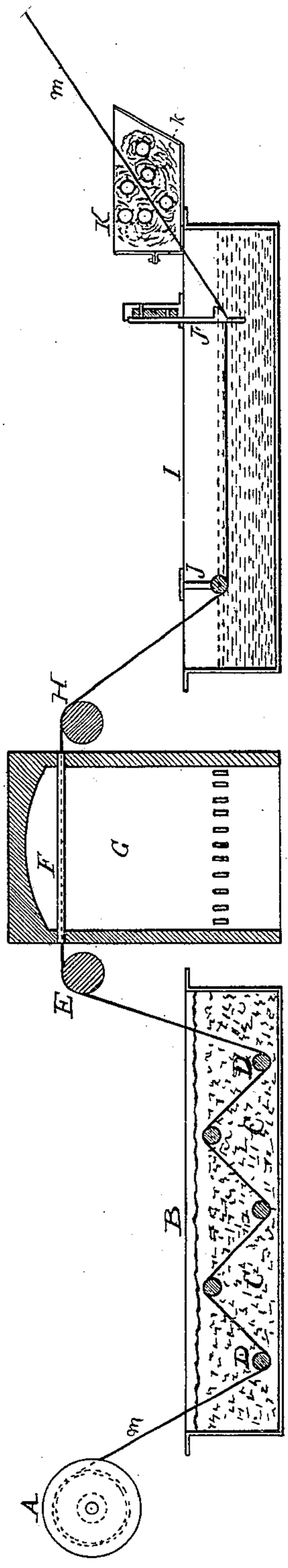

Fig. 1

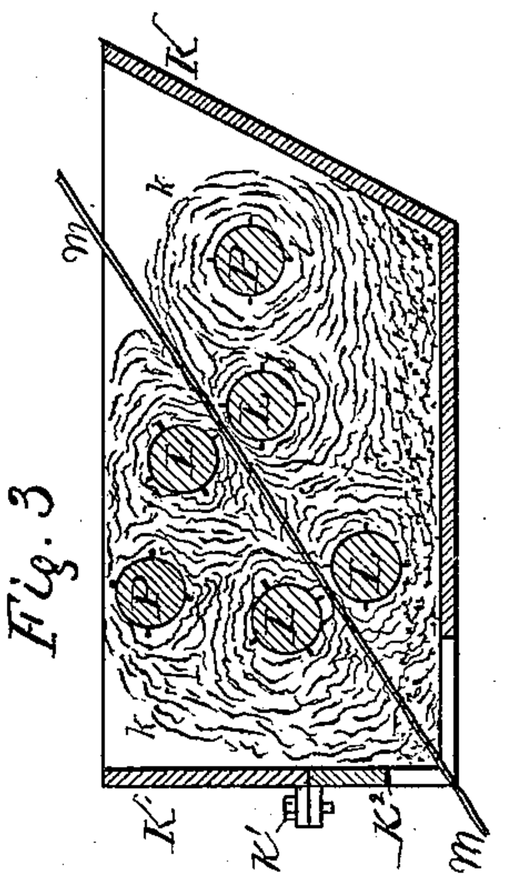

Fig. 3

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2

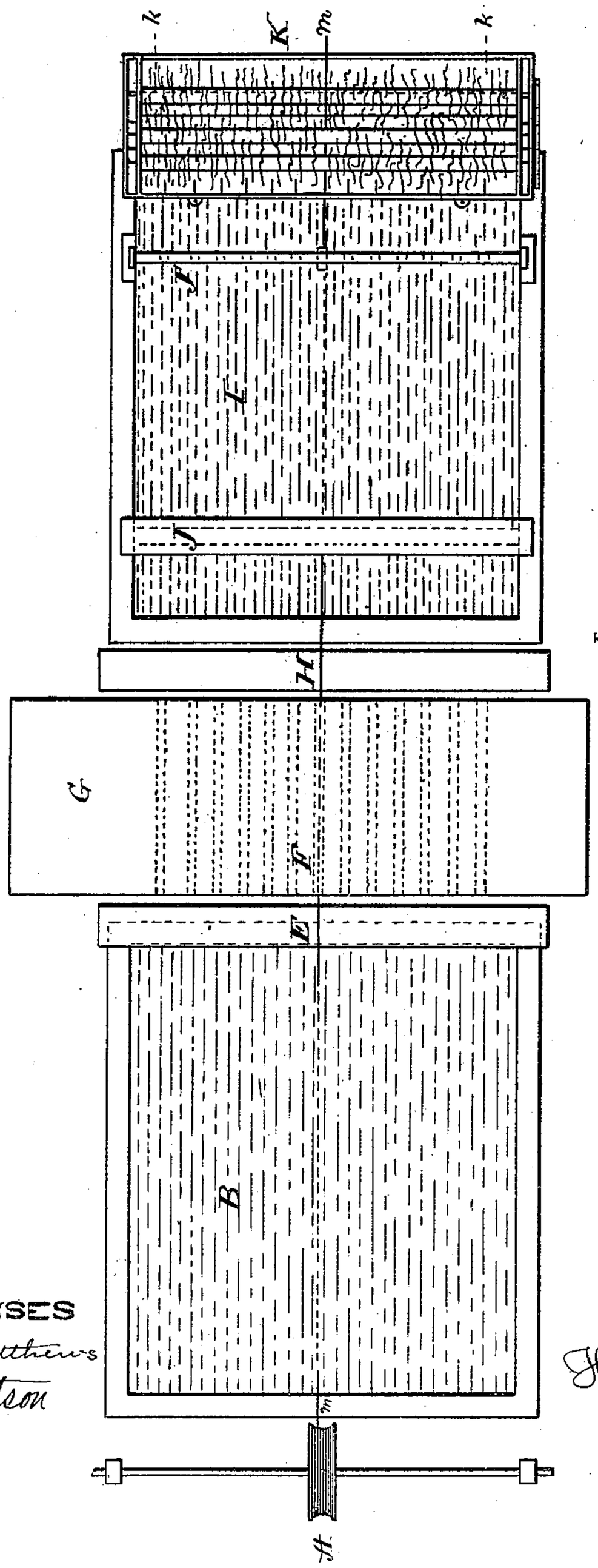
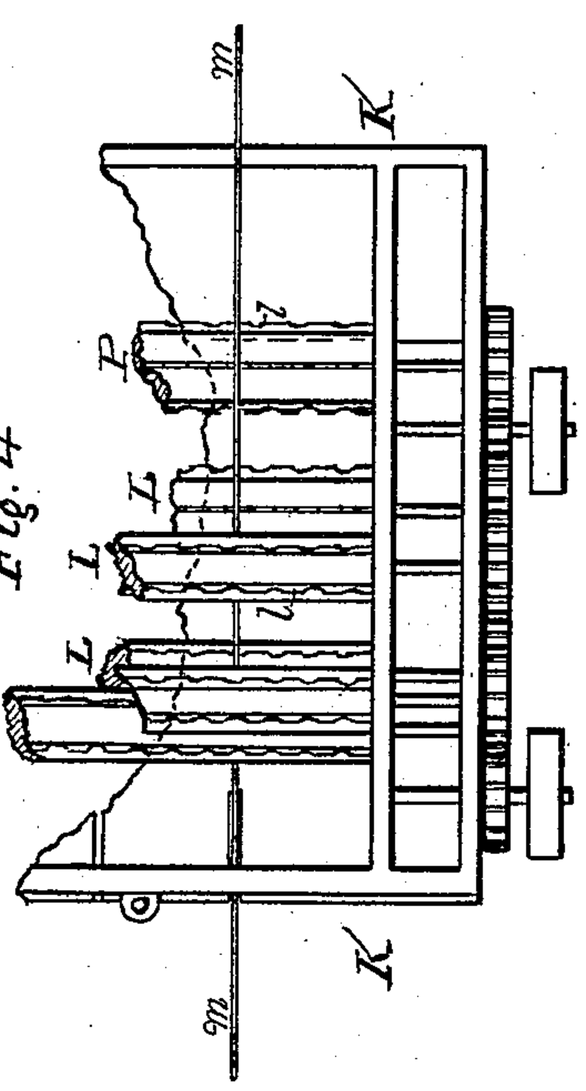


Fig. 4



WITNESSES
R. W. Matthews
C. C. Stetson

INVENTOR
Henry Roberts
by his attorney
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UNITED STATES PATENT OFFICE.

HENRY ROBERTS, OF JOHNSTOWN, PENNSYLVANIA.

COATING METALS WITH ZINC.

SPECIFICATION forming part of Letters Patent No. 262,124, dated August 1, 1882.

Application filed December 17, 1880. (No model.)

To all whom it may concern:

Be it known that I, HENRY ROBERTS, a citizen of the United States, residing at Johnstown, Cambria county, in the State of Pennsylvania, have invented certain new and useful Improvements relating to Coating Metals with Zinc, of which the following is a specification.

The invention applies to the coating of "wires," ordinarily so called, whether round or flat, and also to extended lengths in various other forms, as hoop-iron, &c. There is a tendency of the zinc to become deteriorated in quality by a long subjection to the passage of the wire or analogous length of the iron or other metal to be coated. I will describe the process as applied to the treatment of common round wires, which I will assume are drawn down from rolled rods of Bessemer steel; but it may be understood that any metal capable of being coated with zinc or analogous metal may be substituted, and that the wires may be flat, round, or of various other sections, and that they may be known as "wires" or by the various other technical names, as hoop-iron, bale-ties, or the like.

I provide a long bath of melted zinc, with the heating-fires around the exterior, and the bottom relatively cool for the subsidence of what is known as "dross." I provide the ordinary surface-coating of sal-ammoniac and the ordinary immersing-sinker, beneath which the wires are passed through the bath in order to insure their long and uniform immersion. I provide peculiarly-efficient means for wiping off the surplus metal and for insuring a succession of fresh surfaces of the wiping material. I attain this end by leading the wires in an inclined direction upward from the bath through a mass of suitable wiping material, which is constantly moved in a direction opposite to that of the wires. The wiping being effected in this manner and immediately on the emergence of the wires from the melted bath I can reduce the consumption of zinc to a minimum, and insure that it is left with more than ordinary uniformity of thickness. I have also improved the wiping by the application of a material hitherto unused for the purpose. It is what is known as "slag-wool" or "silicate cotton"—a silky, fibrous matter produced by the treatment of cinder from a blast-furnace by blowing out with a current of steam at high pressure. It is highly elastic and soft, and is not destroyed by the heat, has a just sufficient property of adhesion to the melted metal or wiping power, and is sufficiently mobile in its nature to allow of being worked by rollers, so as to be moved in the manner I desire. I employ two or more pairs of rolls, one behind the other, to complete the wiping. The wires emerge from the wiping smoothly and uniformly coated, and are ready to be wound on reels for transportation and use. The preparation of the surface to receive the melted zinc and the treatment in the bath of zinc may be of the ordinary and long-approved character.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Figure 1 is a vertical section through the entire apparatus. Fig. 2 is a plan view of the same. The remaining figures represent details detached. Fig. 3 is a central vertical section of my improved wiping-box. Fig. 4 is a plan view of a portion of the same, showing the ends of the agitating-rolls, their operating-gear, and the partition-space at the side.

Similar letters of reference indicate like parts in all the figures.

I have shown but one wire.

A is the reel, from which the wire *m* is delivered; B, the acid bath; C, a quantity of broken stone therein; D, a series of rolls, some of which are preferably turned by power to aid the movement of the wire; E, a guiding-sheave; F, tubes through the drying-furnace G; and H, a series of guiding-sheaves, from which the wire is plunged directly into the bath I of melted metal.

J J′ are sinkers in the melted metal, so placed that the wires in passing under these sinkers are certain of being immersed to the proper depth. The tank is of sufficient length to insure a uniformity of temperature between the wires and the bath before the wires emerge. I have in my experiments made the metal-tank I about twelve (12) feet long, and caused the wires to traverse a little over a foot per second. The sinkers J′ are peculiar. There is one of these for each wire. Each has at its upper end an outwardly-projecting lug, which

is just the right size to engage in graduated holes in a bridge or piece spanning the end of the tank. On emerging from the metal bath I the wires are led up through slots in the bottom of a partially-overhanging box, K, which contains a liberal supply of the slag-wool *k*, which serves as the wiping material, and should be kept damp with water or tungstate of soda. The wires are led in an inclined direction through this box, and emerge with just a sufficient coating of zinc. The required circulating movement of the wiping material is attained by rollers L, mounted in the wiping-box, and turned by gearing in the directions indicated by the arrows. The surfaces of the several rolls are armed with projections *l*, which engage with a just sufficient quantity of the slag-wool, and drag it along in the direction opposite to the movement of the wires *m*. The rollers are turned slowly—only about one revolution in two seconds. They agitate the slag-wool and continually present new surfaces thereof to the steadily-moving wires. The general tendency of the rollers is to move the slag-wool gradually from the back to the front of the wiping-box, or, in other words, toward that side of the wiping-box which overhangs the tank. The slag-wool is in its nature a good non-conductor. Its temperature is soon raised by the working, so that it approximates closely to that of the melted zinc, except that the upper stratum is kept wet and relatively cool by sprinkling with water, either ordinary fresh water or preferably a solution of tungstate of soda. The melted zinc removed by the particles of slag-wool, and moved actively toward the receiving side of the box, is deposited in that edge of the box and dropped through the slots there provided into the tank. The affinity or adhesion of the melted metal to the earthy wool is very slight.

Instead of accumulating and becoming densely compacted in the receiving side of the wiping-box, I take measures to produce a circulation of the material. It is worked under and over the several rollers. Each roller of each pair carries the slag-wool toward the tank on one side, where it effects the wiping, and away from it on the other side, where it is returning idly.

P is an additional roll, of which I can use more than one, if necessary; but my experiments do not indicate such need to aid in transferring the fibrous material from that end of the box toward the back or more distant side of the box. The result is a constant agitation of the wiping material, and a presentation of a fresh surface to the melted metal coating on the wire, also a movement of the material between the rolls toward the receiving side of the box, and thence upward and backward to the other side of the box, where it is again moved forward. I believe that the lowermost rollers of each pair also carry a liberal current of the slag-wool downward, and move it backward in the base of the box; but of this I have not so well assured myself. Mineral wool is just sufficiently elastic and glassy in its nature. The action of the rolls not only presents fresh surfaces, and presents them with a motion opposite to that of the wires, so as to insure an effective wiping, but also tends to induce a quite compact condition of the fibrous material at the base of the receiving side of the wiping-box. It tends the better to express any particles of melted metal which have been brought with it from the other portions of the box. I esteem this a marked advantage.

The journals of the several rollers L *l* are of considerable length, and project through two walls, which I provide in each end of the wiping-box, with an air-space between. This facilitates access for examination and oiling, and tends to prevent the induction of heat.

The lower portion of the side of the wiping-box nearest to the tank of melted metal is made in a separate piece from the rest, and can be removed on taking out the screws, which are inserted through lugs in the upper portion of the side. This facilitates the removal of the finely-broken wiping material which tends to accumulate there.

Modifications may be made in the forms and proportions of the details.

I have worked successfully with the wiping-box only about two (2) feet wide, so as to give a wiping traverse of only two (2) feet; but this may be varied. I believe that little gain would result from an increase of the wiping-traverse, because wires of small size become rapidly cooled. For very large wires a wider wiping-box would be expedient.

Instead of slots to receive the wires in the overhanging portion of the wiping-box K, I can use plain round holes; but I esteem slots preferable. There is a tendency of the slag-wool to become worn, abraded, or broken, so as to accumulate a fine dust in the bottom. When this has become too fine I replace it with fresh. No particular difficulty is experienced if considerable of the broken earthy matter falls upon the melted zinc.

The dotted circles represent the gearing by which the rolls L are turned. I have not deemed it necessary to represent the belt through which the motion is received. I mount them in two independent trains, in order that I can, if preferred, after the operation has fairly commenced, arrest the motion of the rolls which are farthest from the metal bath and operate the remainder.

The mineral wool which I employ possesses the same capacity for wiping off the surplus metal from the wire as the various fibrous materials heretofore employed for that purpose, and it acts as efficiently, while, by reason of its mineral character and its capacity to endure a high temperature, it is not destroyed or seriously affected by the hot zinc, and can perform indefinitely for a long period. The movement of the mineral wool loaded with the

metal toward the tank, with the provisions for its easy escape therefrom to fall into the tank again, insures that a large proportion of the metal which is wiped off shall be restored immediately to the tank without its cooling. Those particles of metal which are cooled and remain adhering to the mineral wool can be afterward recovered.

The specific arrangement of the rollers and gearing and the slag-wool employed as the wiping material form the subjects of separate applications for patents. So, also, the peculiarities of the acid bath and drying-furnace form the subject of a separate application for patent.

I claim as my improvement in zinc-coating wires—

The method of removing the surplus of melted metal from the wires on emerging from the bath by working the wiping material *k*, so as to present constantly fresh surfaces, substantially as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, this 7th day of December, 1880, in the presence of two subscribing witnesses.

HENRY ROBERTS.

Witnesses:

W. COLBORNE BROOKS,

H. A. JOHNSTONE.