

W. E. GIBBS.  
 APPARATUS AND PROCESS FOR MAKING WIRE ELECTROLYTICALLY.  
 APPLICATION FILED SEPT. 4, 1909.

Patented Apr. 8, 1913.

2 SHEETS-SHEET 1.

1,058,047.

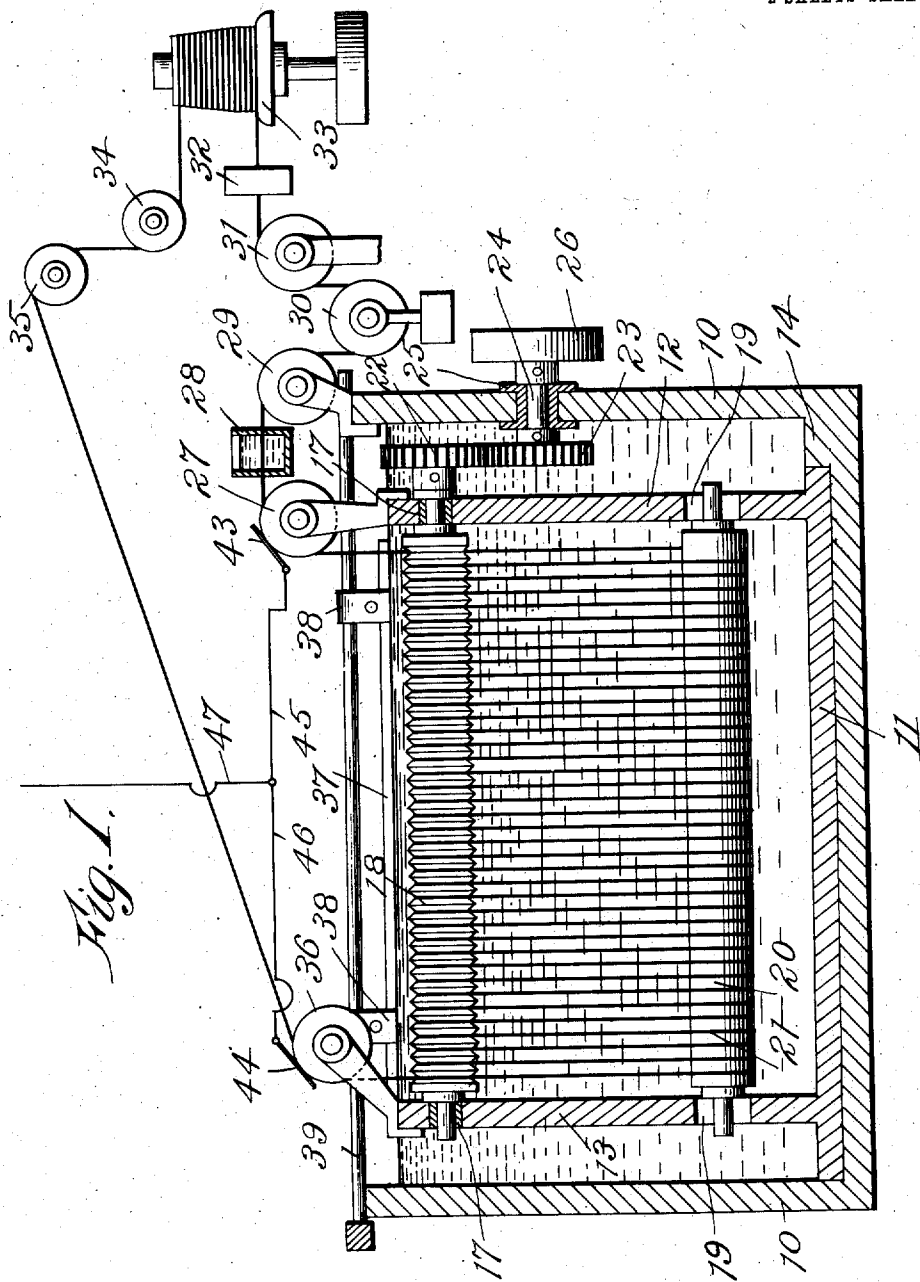


Fig. 1.

Witnesses:  
 H. H. Knight  
 Octavius Knight

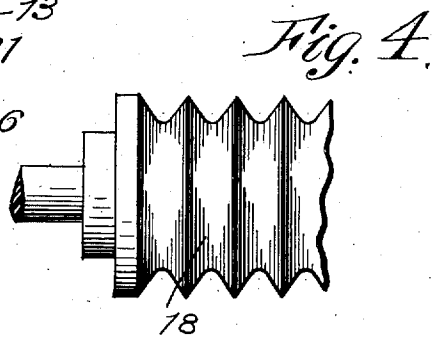
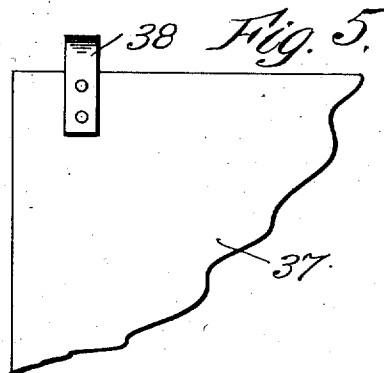
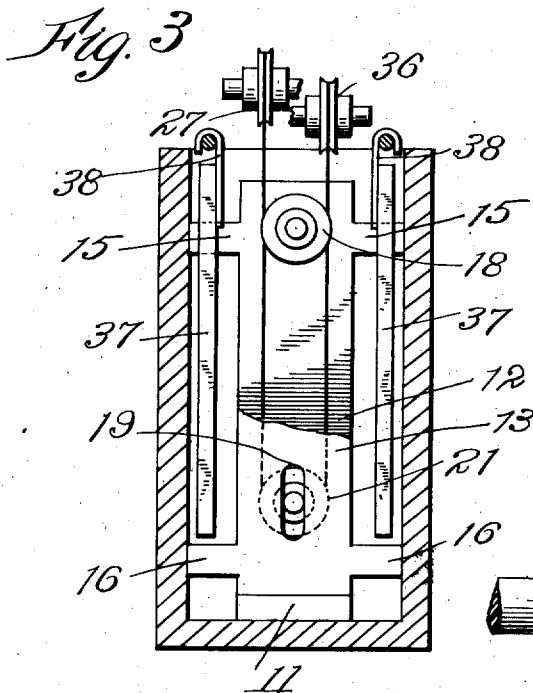
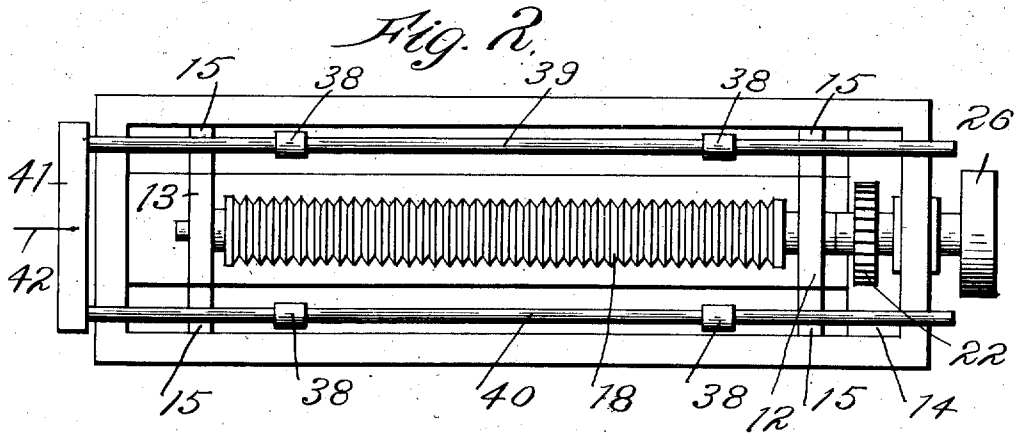
Inventor  
 William E. Gibbs  
 By his Attorneys  
 Hughes & Co.

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2 SHEETS-SHEET 2.



Witnesses:  
*W. E. Gibbs*  
*Oscarus Hughes*

Inventor  
*William E. Gibbs*  
 By his Attorneys  
*[Signature]*

# UNITED STATES PATENT OFFICE.

WILLIAM E. GIBBS, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO GIBBS COMPANY, OF PLAINFIELD, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## APPARATUS AND PROCESS FOR MAKING WIRE ELECTROLYTICALLY.

1,058,047.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed September 4, 1909. Serial No. 516,162.

*To all whom it may concern:*

Be it known that I, WILLIAM E. GIBBS, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus and Processes for Making Wire Electrolytically, of which the following is a full and clear specification.

My invention relates to a process and apparatus for the production of wire, especially copper wire.

The object of my invention is to eliminate the rolling mill from that series of operations whereby a metal is reduced from the form of ingots to the form of wire.

While my invention may be applied to the production of wire from various metals and alloys, it is peculiarly well adapted to the manufacture of copper wire, and for this reason in the description of the process which follows I shall refer to that metal.

The usual procedure in making copper wire is as follows: 1. The pig copper is cast into anodes. 2. The copper of the anodes is electrolytically deposited upon plates of pure copper, forming cathodes of pure copper, while the impurities of the anodes are retained in the depositing vats. 3. The cathodes are melted and cast into ingots or bars. 4. The ingots are passed several times through a rolling mill to form "wire rods." 5. The wire rods are drawn through a succession of "draw-plates" to form wire.

By my process, I deposit the copper of the anodes upon an endless wire which is kept in motion partly or entirely in the solution in an electro-plating vat, and which is constantly being drawn out from one end of the vat, thence through a draw-plate and returned by means of suitable mechanism to the remote end of the vat through which it again passes. It is the sense of my invention that the wire which leaves the draw-plate shall be substantially the same as that with which the process started. Thus if number 14 wire were placed in the vat, it would be drawn through a number 14 draw-plate. By this means the copper which has been deposited on the original wire during its passage through the electrolytic solution causes the wire which reaches the draw-plate to be of somewhat larger size than it was at the point where it entered the solu-

tion. The process of drawing the wire through the draw-plate constantly restores the wire to its original diameter, whereby the growth of the wire, by the gradual addition of copper from the solution is lengthwise. By means of suitable mechanism the wire is fed into one end of the vat at the same rate that it is taken out from the other end. Therefore the vat is always full of wire and consequently working at its maximum capacity in depositing copper. Since the wire on its passage through the draw-plate is elongated, it will move more rapidly than that portion which is being returned to the vat, so that wire will constantly accumulate outside the vat in exactly the proportion that copper has been added to it during its passage through the solution. When a sufficient quantity has, in this way, accumulated outside the vat, the wire on each side of the finished coil is cut. The coil is removed and the ends of the shortened wire are joined by welding. The process then goes on as before until another portion of wire has accumulated.

The process may be carried out in the apparatus which is shown in the accompanying drawings and which also forms a part of my invention.

In said drawings: Figure 1 is an elevation, part in longitudinal section, of the apparatus. Fig. 2 is a top plan view of the electrolytic vat. Fig. 3 is a transverse vertical section through the vat near the end. Fig. 4 is a detail view of a portion of the grooved drum for carrying the wire through the vat, and Fig. 5 is a detail view of a portion of an anode, showing one of the hooks by which it is hung.

Referring now more specifically to said drawings 10 indicates a vat of suitable construction for containing the electrolytic bath. The vat 10 is adapted to receive and contain a frame comprising a base 11 and side pieces 12, 13, the base extending from one end of the vat to a block or shoulder 14 at the other end, and the side pieces having upper projections 15 and lower projections 16 extending to the sides of the vat so that the frame is held in proper position within the vat. This construction permits raising and lowering of the frame when necessary. The side pieces are also provided with bearings 17 for the grooved drum 18 and slot

bearings 19 for the drum 20. The grooved drum 18 and the drum 20 are adapted to support and advance the wire 21 within the electrolytic bath, the drum 20 being suspended by the wire and guided by the slots 19. Grooved drum 18 has a driving gear wheel 22 which meshes with a gear wheel 23 secured on shaft 24 journaled in bearing 25 in the wall of the vat 10, and driven by belt pulley 26. The engagement of the gear wheel 23 is made when the frame is lowered into the vat by having the gear wheel 23 underneath the gear wheel 22, which construction at the same time permits the raising of the frame from the bath. The block 14 above referred to is of such dimension as to fill in the space between the end of the base 11 and the frame and the end of the wall of the vat 10, which space must be left to provide for the clearance between the frame and the gear wheel 23 when the frame is raised. The wire 21 is wound over the two drums 18 and 20, each turn of wire being disposed in one of the grooves of the drum 18 so that upon rotation of the drum the wire is fed constantly forward through the bath. The wire issues at the end of the bath over an idler 27 through a suitable wash 28 for removing the copper sulfate or other objectionable substances from the bath, and thence over an idler 29 under a take-up device 30 and over an idler 31 through draw-plate 32, being drawn through the draw-plate by the drawing drum or "block" 33 of well known construction. The coil formed on "block" 33 feeds off under an idler 34 over idler 35 and is directed back to the grooved drum 18 by the idler 36. The idlers 27 and 36 may be mounted in suitable manner upon the side pieces 12 and 13 respectively of the frame and preferably idler 27 will be positioned so as to maintain the alinement of the wire as it comes from the drum, while the idler 36 is positioned so as to maintain the alinement of the wire as it comes to the drum, thus maintaining the plane of the wire on each idler normal to the axis of rotation.

The anodes 37 are preferably provided with hooks 38 in known manner, whereby they are hung upon conducting rods 39, 40, joined by conducting bar 41 to which current is led by conductor 42. The conducting frame thus formed may rest upon the top of the vat and the anodes be hung thereon, preferably one at each side of the drums 18 and 20. The current passing into the anodes and from them through the bath into the copper wire may be led off by brushes 43, 44 and conductors 45, 46 to common conductor 47.

In operation the copper wire is suitably wound upon the drums 18 and 20 and passed through the draw-plate and other parts of the apparatus with several turns

about the "block" 33. The frame which supports the drums 18 and 20 is raised during this operation. The frame is then lowered into operating position with the gear 22 in mesh with gear 23, and the ends of the wire welded together. The apparatus is then set in motion and the wire passes continuously through the electrolytic bath and the draw-plate in cyclic manner. The drawing drum or "block" 33 serves to pull the wire through the draw-plate while the grooved drum 18 serves to advance the wire through the electrolytic bath. The drum 20, being suspended by the wire and being capable of slight vertical movement, maintains the proper tension on the turns of wire which pass over the grooved drum 18, whereas the take-up device 30 keeps the wire under proper tension as it goes to the draw plate. The "block" 33 being continuously rotated coils the wire in well known manner giving it off at the end of the coil. The diameter of the wire will be slightly increased during its passage through the electrolytic bath and this increment in diameter is changed to a lengthwise increment by the passage of the resultant product through the draw-plate. The lengthwise increment is received and taken up by the block 33 so that as the operation progresses the coil on "block" 33 will be growing. When the increment reaches the proper amount it is separated from the rest of the wire and the ends of the remaining wire are quickly welded together by electrical or other suitable means well known to those skilled in this art. The ends are preferably butt welded so as to avoid, so far as possible, any unevenness in the joint. During the passage of the wire through the electrolytic bath any unevenness which there might be at the joint will be largely equalized by the deposition. The height of the solution may be such as to entirely cover the turns of wire upon the drums 18 and 20, or when desirable may be kept so that the upper portions of the turns will be out of the solution.

I do not claim in this application the product obtained by the apparatus and process herein shown, as the same is reserved for claiming in a separate application.

I claim:

1. The process of making copper wire which comprises depositing copper upon a copper wire whereby its diameter is increased, elongating the product of increased diameter, thereby decreasing the diameter, detaching a portion of the total length of the resultant product and repeating the operations of deposition and elongation upon the remaining portion of the resultant product.

2. The process of making copper wire which comprises maintaining a length of copper wire in an electrolytic bath whereby

copper is deposited upon the wire and its diameter increased, leading the resultant product through and from the vat, elongating it while still maintaining the succeeding portion of the wire within the vat, joining the advance end of copper wire to the trailing end of the wire contained within the vat and thereby leading the advance end through the vat.

3. The process of making copper wire which comprises continuously increasing the diameter of a copper wire by electrolytic deposition, and continuously elongating the resultant product, in a cyclic manner.

4. The process of making copper wire which comprises increasing the diameter of a copper wire by electrolytic deposition, and elongating the resultant product by a drawing operation until a suitable lengthwise increment is obtained, separating the increment from the rest of the wire, joining the ends of the remaining wire and repeating the operations of deposition and elongation.

5. The process of making copper wire which comprises continuously passing an endless copper wire in a cyclic manner through an electrolytic bath, and a drawing device whereby a lengthwise increment of the wire is obtained, separating the increment from the rest of the wire, connecting together the two ends of the remaining wire, and repeating the operations, in a cyclic manner.

6. In apparatus of the character described, the combination with means for continuously depositing copper upon a copper wire; of means for continuously drawing

the resultant product, whereby a lengthwise increment is obtained.

7. In apparatus of the character described, the combination with an electrolytic bath and a draw-plate; of means for continuously passing the endless copper wire through said electrolytic bath and said draw-plate, in a cyclic manner, and means for receiving and taking up the resultant lengthwise increment of the wire.

8. In apparatus of the character described, the combination with an electrolytic vat adapted to contain an electrolytic bath, and a driving drum and an idle drum suitably supported therein and adapted to advance a copper wire through the electrolytic bath; of a draw-plate and means for conveying the copper wire from the electrolytic bath through the draw-plate and returning it to the electrolytic bath.

9. In apparatus of the character described, the combination with an electrolytic vat adapted to contain an electrolytic bath, and a grooved driving drum and an idle drum suitably supported therein and adapted to advance a copper wire through the electrolytic bath; of a draw-plate, a drawing drum adapted to draw the wire from the electrolytic bath through said draw-plate and receive the increment of the wire, and means for directing the wire from the drawing drum back to the electrolytic bath.

WILLIAM E. GIBBS.

Witnesses:

HARRY E. KNIGHT,  
OCTAVIUS KNIGHT.

Correction in Letters Patent No. 1,058,047.

It is hereby certified that in Letters Patent No. 1,058,047, granted April 8, 1913, upon the application of William E. Gibbs, of Pittsburgh, Pennsylvania, for an improvement in "Apparatus and Processes for Making Wire Electrolytically" an error appears in the printed specification requiring correction as follows: Page 2, line 51, for the reference numeral "30" read 39; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of April, A. D., 1913.

[SEAL.]

C. C. BILLINGS,

*Acting Commissioner of Patents.*

copper is deposited upon the wire and its diameter increased, leading the resultant product through and from the vat, elongating it while still maintaining the succeeding portion of the wire within the vat, joining the advance end of copper wire to the trailing end of the wire contained within the vat and thereby leading the advance end through the vat.

3. The process of making copper wire which comprises continuously increasing the diameter of a copper wire by electrolytic deposition, and continuously elongating the resultant product, in a cyclic manner.

4. The process of making copper wire which comprises increasing the diameter of a copper wire by electrolytic deposition, and elongating the resultant product by a drawing operation until a suitable lengthwise increment is obtained, separating the increment from the rest of the wire, joining the ends of the remaining wire and repeating the operations of deposition and elongation.

5. The process of making copper wire which comprises continuously passing an endless copper wire in a cyclic manner through an electrolytic bath, and a drawing device whereby a lengthwise increment of the wire is obtained, separating the increment from the rest of the wire, connecting together the two ends of the remaining wire, and repeating the operations, in a cyclic manner.

6. In apparatus of the character described, the combination with means for continuously depositing copper upon a copper wire; of means for continuously drawing

the resultant product, whereby a lengthwise increment is obtained.

7. In apparatus of the character described, the combination with an electrolytic bath and a draw-plate; of means for continuously passing the endless copper wire through said electrolytic bath and said draw-plate, in a cyclic manner, and means for receiving and taking up the resultant lengthwise increment of the wire.

8. In apparatus of the character described, the combination with an electrolytic vat adapted to contain an electrolytic bath, and a driving drum and an idle drum suitably supported therein and adapted to advance a copper wire through the electrolytic bath; of a draw-plate and means for conveying the copper wire from the electrolytic bath through the draw-plate and returning it to the electrolytic bath.

9. In apparatus of the character described, the combination with an electrolytic vat adapted to contain an electrolytic bath, and a grooved driving drum and an idle drum suitably supported therein and adapted to advance a copper wire through the electrolytic bath; of a draw-plate, a drawing drum adapted to draw the wire from the electrolytic bath through said draw-plate and receive the increment of the wire, and means for directing the wire from the drawing drum back to the electrolytic bath.

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OCTAVIUS KNIGHT.

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C. C. BILLINGS,

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