

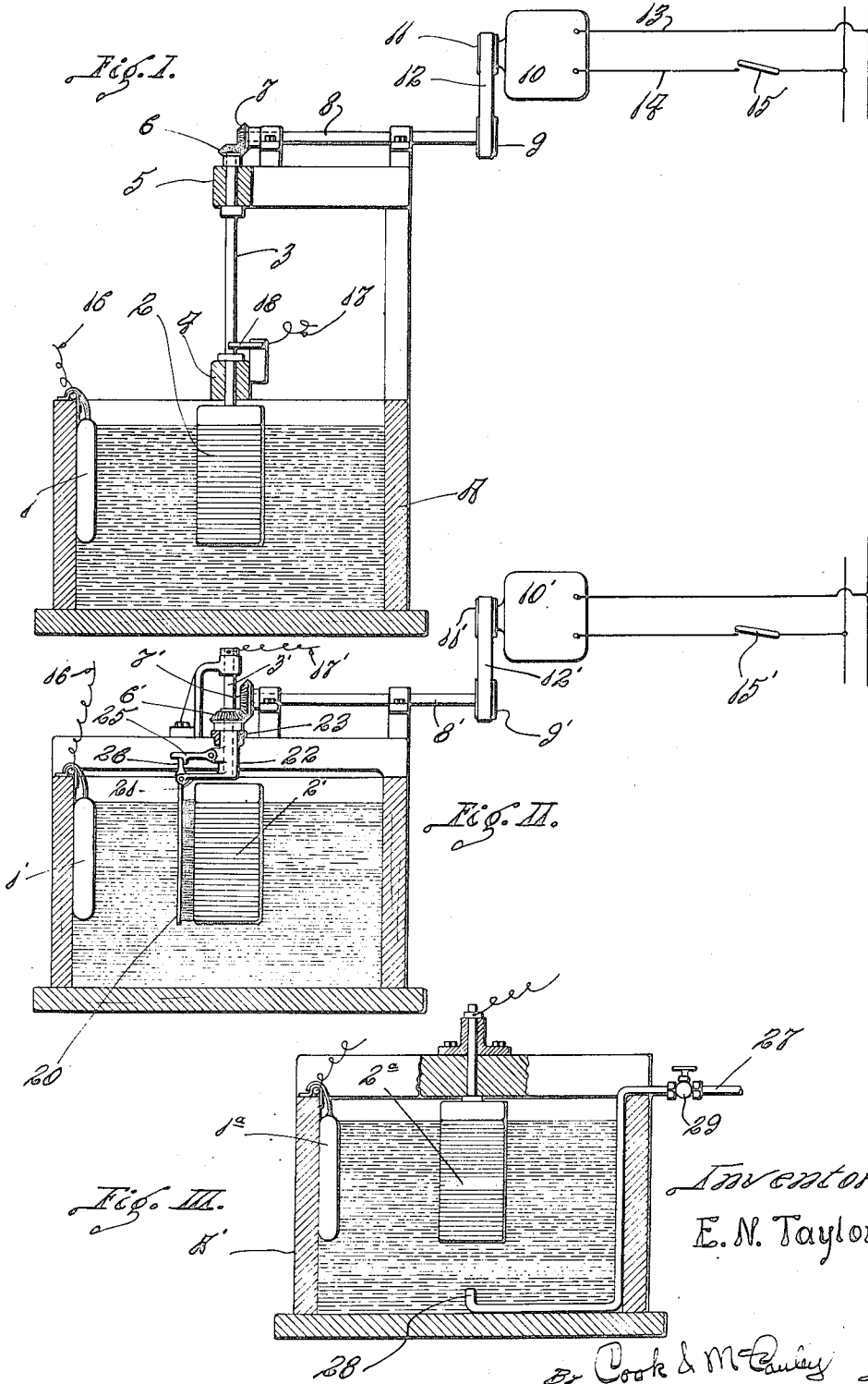
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METHOD OF ELECTROPLATING

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METHOD OF ELECTROPLATING.

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To all whom it may concern:

Be it known that I, EDWARD N. TAYLOR, a citizen of the United States of America, and a resident of the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Methods of Electroplating, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in methods of electro-plating, the main object being to provide a method or process of this kind whereby a smooth, uniform coating of metal is deposited on the surface of the object undergoing the plating operation.

Prior to this invention, tiny gas bubbles and solid impurities have collected on surfaces being plated in an electro-plating solution, and as a consequence numerous small pits have been found in the plated surface. This is especially true of articles plated with zinc in the usual manner, it being customary to avoid any forcible disturbance of the solution at the surface on which the metal is deposited, and foreign matter such as solid impurities and minute gas bubbles is permitted to cling to this surface, with the result of very materially impairing the appearance and durability of the plating.

I am aware that gas bubbles and the like can be removed by imparting a constant rapid motion to the article in the electroplating solution, but a continuous motion of this kind results in an undesirable coarse, crystalline deposit.

It will now be understood that in one of the old methods there is no forcible disturbance of the solution at the surface to be plated, and this method produces a plated surface having numerous small pits, and on the other hand, if either the article or the solution is constantly in motion or constantly displaced, a coarse, crystalline deposit will be formed on the surface of the article.

My object is to obtain a smooth, uniform, tenacious and durable coating firmly adhering to the surface of the work, and this is accomplished by a new method in which gas bubbles, and the like, are intermittently removed from the deposit on the article in the electro-plating solution. More specifically stated, the solution and the article are permitted to remain quiescent for relatively

long intervals of time, and the bubbles, etc., are removed during relatively short intervening periods. This results in a most effective deposition of the metal during the long intervals, and the disturbance for relatively short periods does not materially impair the properties of the plating.

In the preferred form of the invention, the solution in contact with the deposit is agitated at intervals, either by forcibly moving the article being plated, or by otherwise acting upon the solution to wash away the impurities on the deposit. Actual experience has shown that very satisfactory results can be obtained by rapidly moving the article for a period of three seconds during each minute, and permitting the article and solution to remain quiet, or nearly so, during the other fifty-seven seconds. It is to be understood, however, that the invention is not limited to the preferred form of the invention as herein set forth.

Fig. I is a diagrammatical view of an apparatus adapted for use in carrying out the new method.

Fig. II is a view similar to Fig. I, showing another apparatus.

Fig. III is a diagrammatical view of another apparatus adapted for use in the new method.

In Fig. I, A designates a tank, or vat, containing an electro-plating solution in which an anode 1 and a cathode 2 are submerged. The cathode may consist of a number of rings constituting the work, or object to be plated, said rings being secured to a vertical shaft 3 mounted in bearings 4 and 5 and provided with a gear wheel 6 at its upper end. The wheel 6 is in mesh with a gear wheel 7 on a rotary shaft 8 provided with a pulley 9. An electric motor 10 is provided with a pulley 11 and a belt 12 whereby motion is transmitted to the pulley 9.

Through the medium of the mechanism just described, the cylindrical cathode 2 can be rotated about its own axis. The means for energizing and controlling the motor 10 comprises conductors 13 and 14 connected to the motor, the conductor 14 being provided with a controlling switch 15 adapted to start and stop the motor.

The electro-plating apparatus shown by Fig. I may be considered as a zinc-plating apparatus involving the use of any suitable solution in the vat A. The electric current

may be transmitted through a positive wire 16 connected to the anode 1 and a negative wire 17 connected to a brush 18 engaging the rotary shaft 3 from which the cathode is suspended.

The motor 10 is operated at intervals to rotate the cathode 2 in the solution, thereby violently agitating the solution around the cathode to forcibly wash away minute gas bubbles and other impurities that tend to accumulate on the deposit. In a zinc plating apparatus, I have found that highly satisfactory results can be obtained by driving the periphery of the cathode at the rate of 400 feet per minute for a period of three seconds during each minute, and permitting the cathode and solution to remain approximately still during the remaining fifty-seven seconds.

Fig. II shows an electro-plating apparatus wherein the cathode 2' is secured to a non-rotary rod 3' to which an electrical conductor 17' is connected. 1' is the anode suspended in the solution. A brush 20 is pivoted to a crank arm 21 extending from a rotary sleeve 22 surrounding the rod 3' and mounted in a bearing 23. A gear wheel 6', fixed to sleeve 22, meshes with a gear wheel 7' on a rotary shaft 8' provided with a pulley 9'. A motor 10' is provided with a pulley 11' and a belt 12' through which motion is transmitted to pulley 9'. The motor is controlled by a switch 15'.

The brush 20 is adapted to engage and revolve around the periphery of the cathode 2', so as to remove bubbles and solid impurities from the deposit on the cathode. The motor 10' is operated intermittently to impart an intermittent rotary motion to the brush.

A latch member 25 is pivoted to the rotary sleeve 22 and provided with a tooth adapted to engage a finger 26 extending from the handle of brush 20. When the parts are positioned as shown in Fig. II, the latch member 25 cooperates with finger 26 to retain the brush in engagement with, or adjacent to, the cathode 2'. During the intervals that the brush is not in motion it is separated from the anode, and the tooth on latch member 25 will then cooperate with finger 26 to hold the brush away from the cathode.

In Fig. III the anode 1^a and cathode 2^a are suspended in the electro-plating solution in a vat A'. An air conducting pipe 27 is provided with a nozzle 28 arranged in the solution and located adjacent to the cathode 2^a. Compressed air is transmitted through the pipe 27 and discharged at the nozzle 28,

thereby agitating the solution and forcibly removing gas bubbles and solid impurities from the deposit on the cathode 2^a. The flow of compressed air is controlled by a valve 29, and this valve is intermittently opened and closed to agitate the solution for brief periods of time and to leave the solution in its normal quiescent state during longer intervening periods.

I claim:

1. The method of electro-plating which comprises plating the surface of an article in an electro-plating solution, permitting the solution to remain substantially quiescent for relatively long periods of time, and forcibly removing foreign matter from said surface during shorter intervening periods.

2. The methods of electro-plating which comprises plating the surface of an article in an electro-plating solution, at the same time intermittently agitating the solution around said surface for brief periods of time to remove gas bubbles from the surface, and permitting the solution to remain quiescent for longer intervening periods.

3. The method of electro-plating which comprises plating the surface of an article in an electro-plating solution, permitting the solution to remain substantially quiescent for relatively long periods of time, and violently agitating the solution around said surface during shorter intervening periods, so as to forcibly remove gas bubbles from the deposit on said surface.

4. The method of electro-plating which comprises plating the surface of an article in an electro-plating solution, and imparting an intermittent motion to the article.

5. The method of electro-plating which comprises plating the surface of an article in an electro-plating solution, and imparting a rapid intermittent motion to the article for brief periods of time, so as to forcibly remove foreign matter from the deposit on the surface of the article.

6. The method of electro-plating which comprises plating the surface of an article in an electro-plating solution, imparting a rapid intermittent motion to the article for brief periods of time, so as to violently agitate the solution at the deposit on the surface of the article, and permitting the article and the solution to remain substantially quiescent for longer intervening periods of time.

In testimony that I claim the foregoing I hereunto affix my signature.

EDWARD N. TAYLOR.