No. 615,940. Patented Dec. 13, 1898.

W. WRIGHT.

APPARATUS FOR DEPOSITING METAL ON TUBES OR PIPES.

(Application filed Dec. 27, 1897.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1

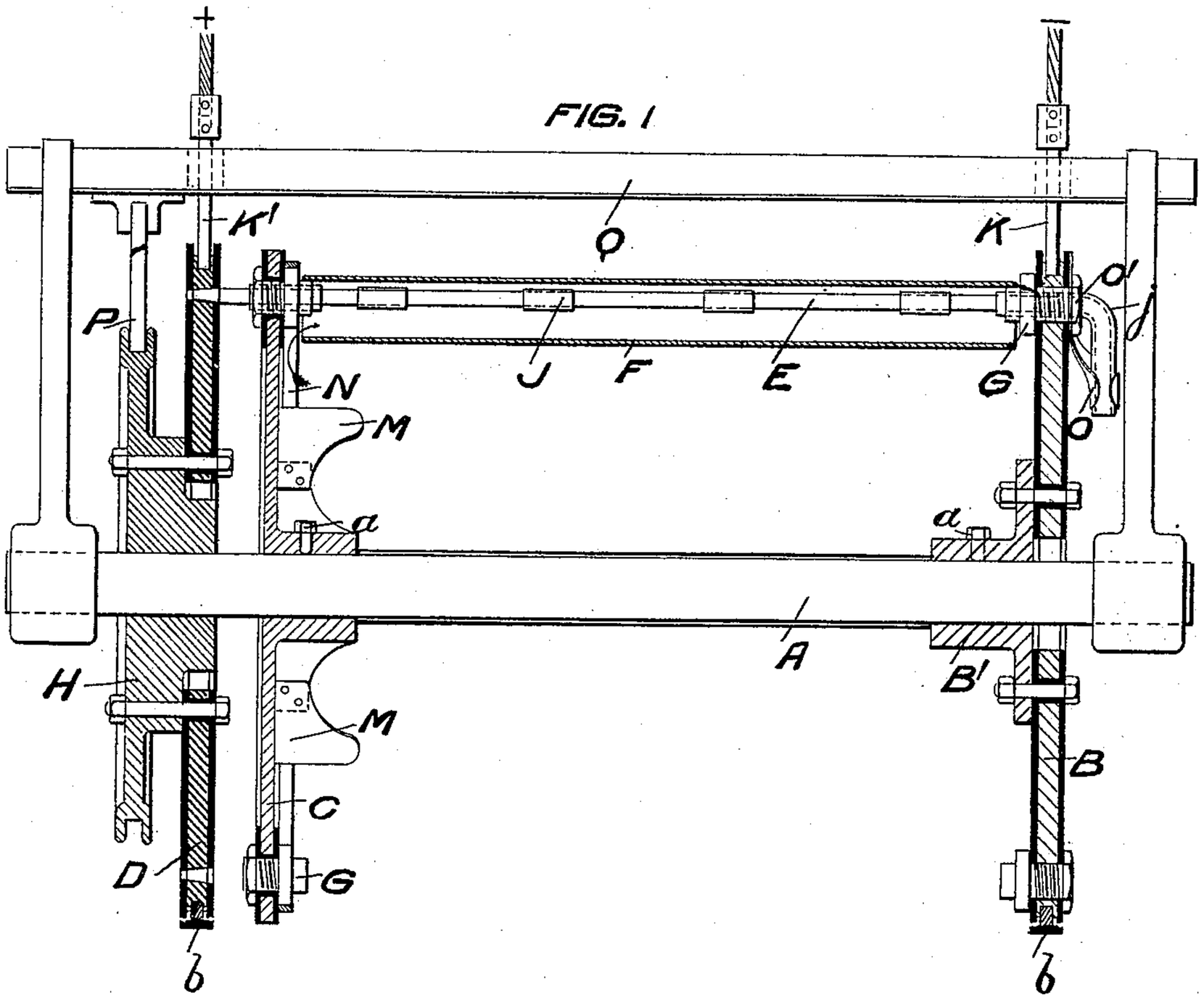
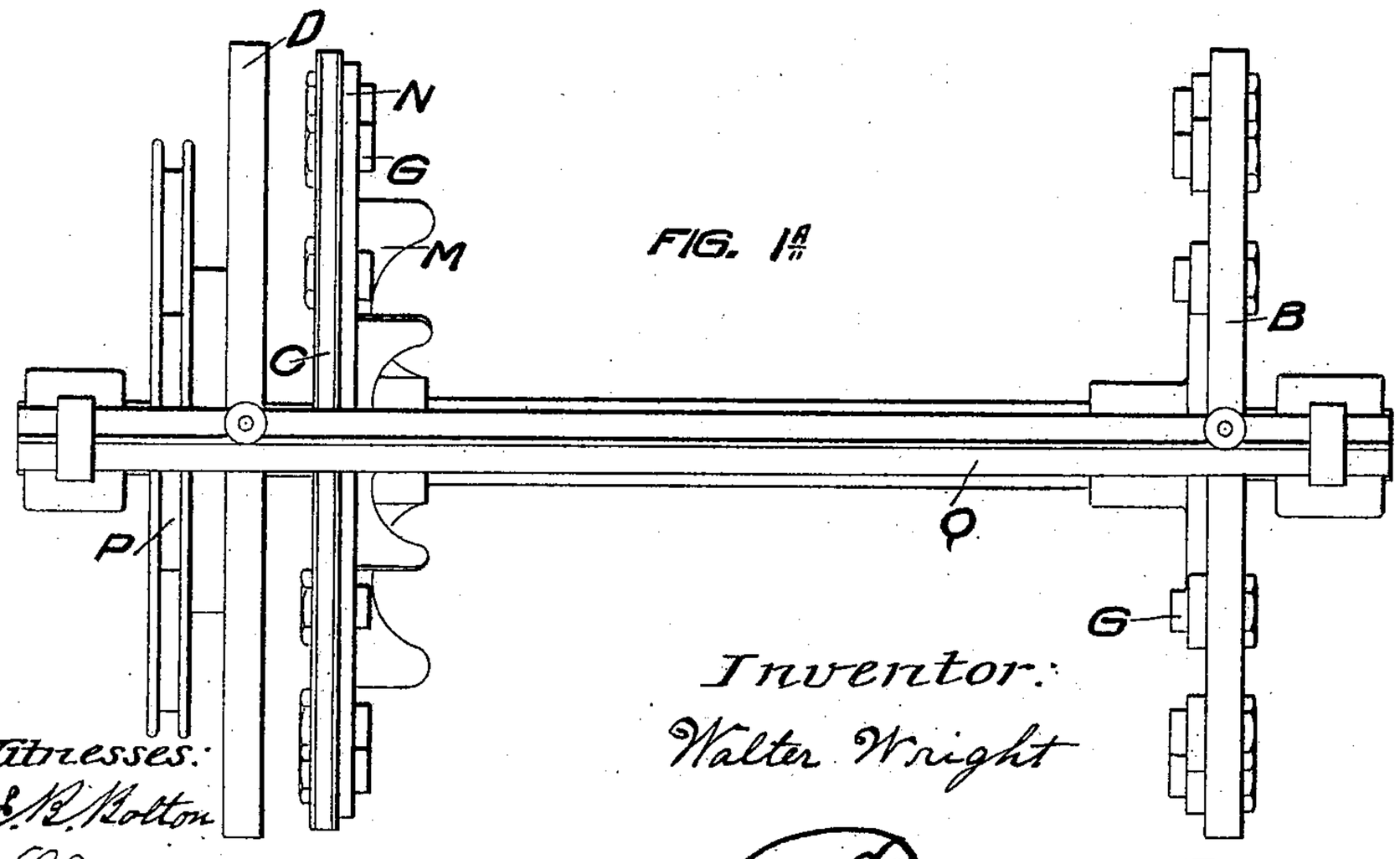


FIG. 1A



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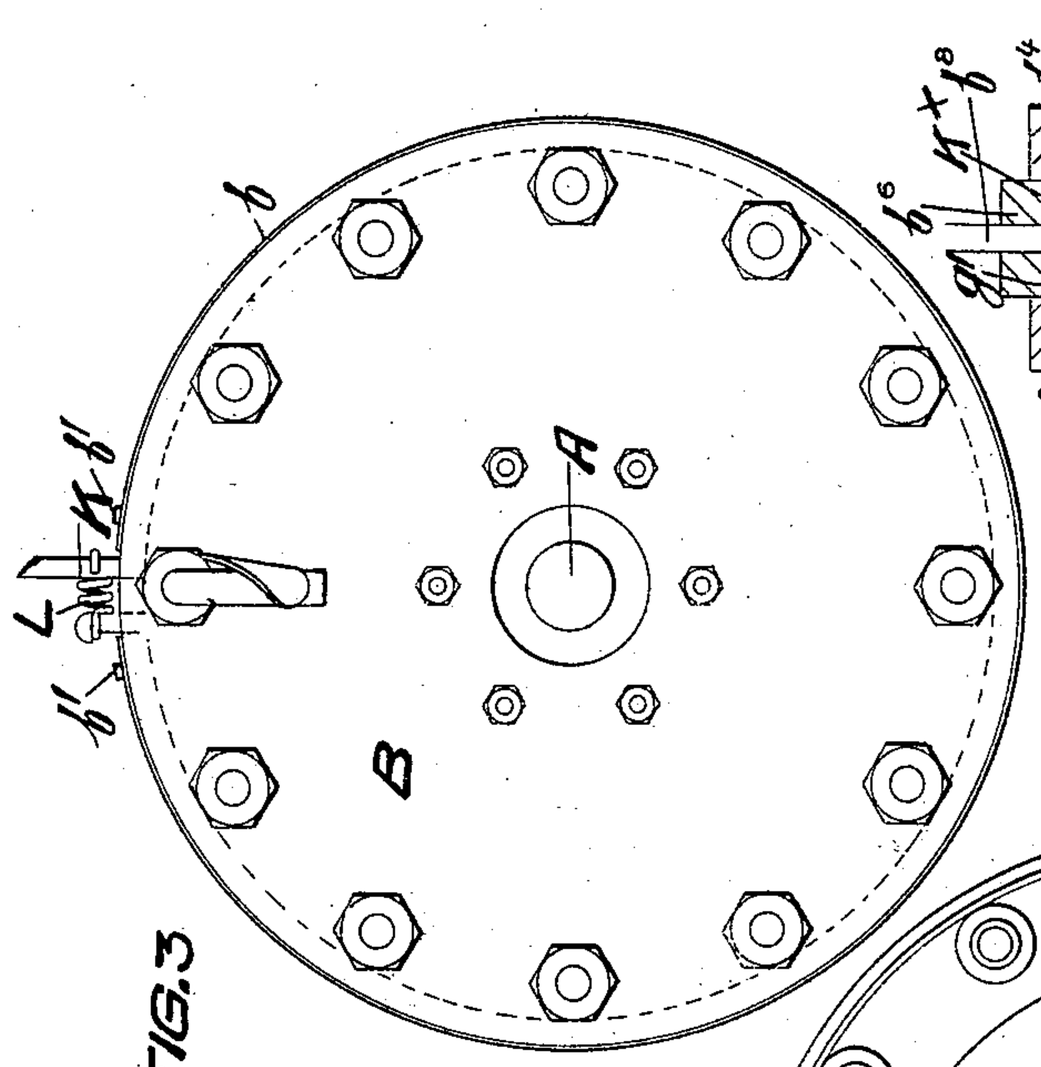

FIG. 3

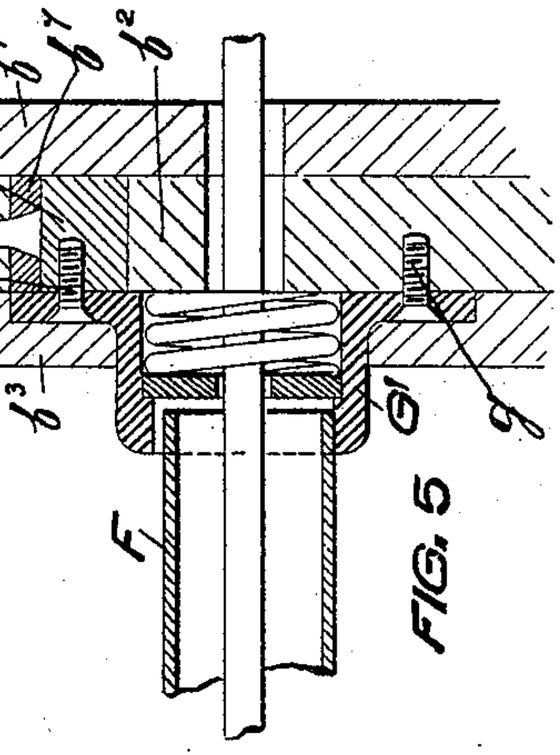

FIG. 5

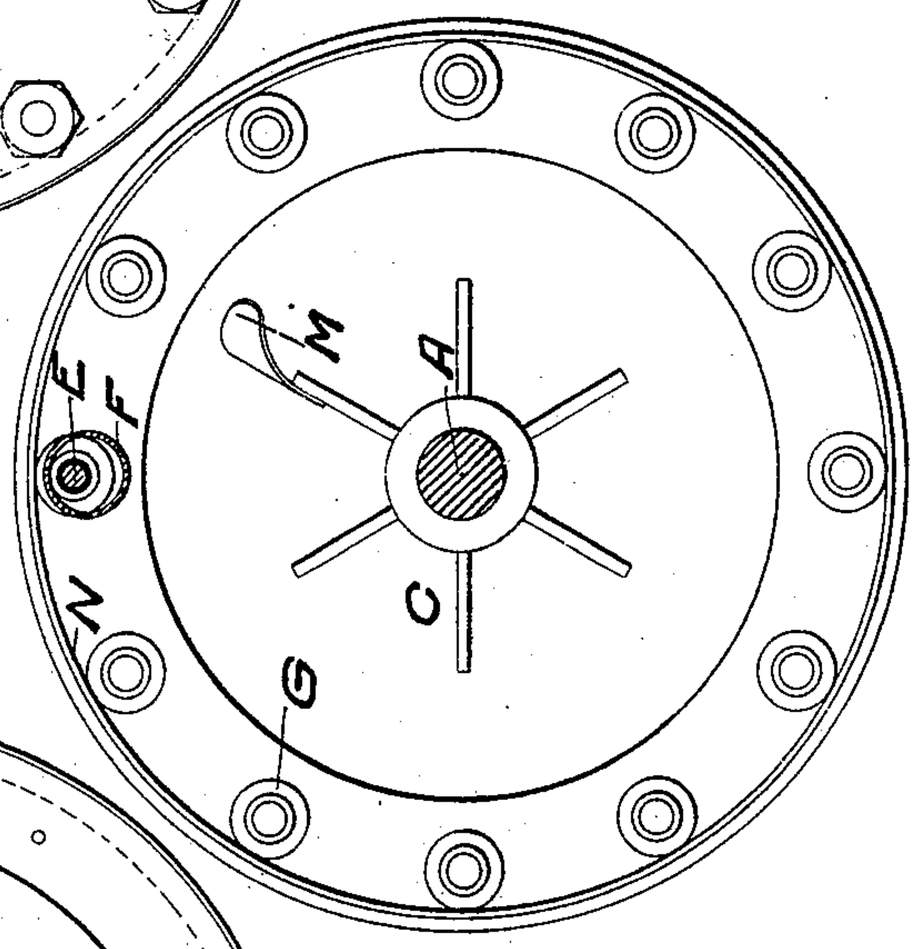

FIG. 4

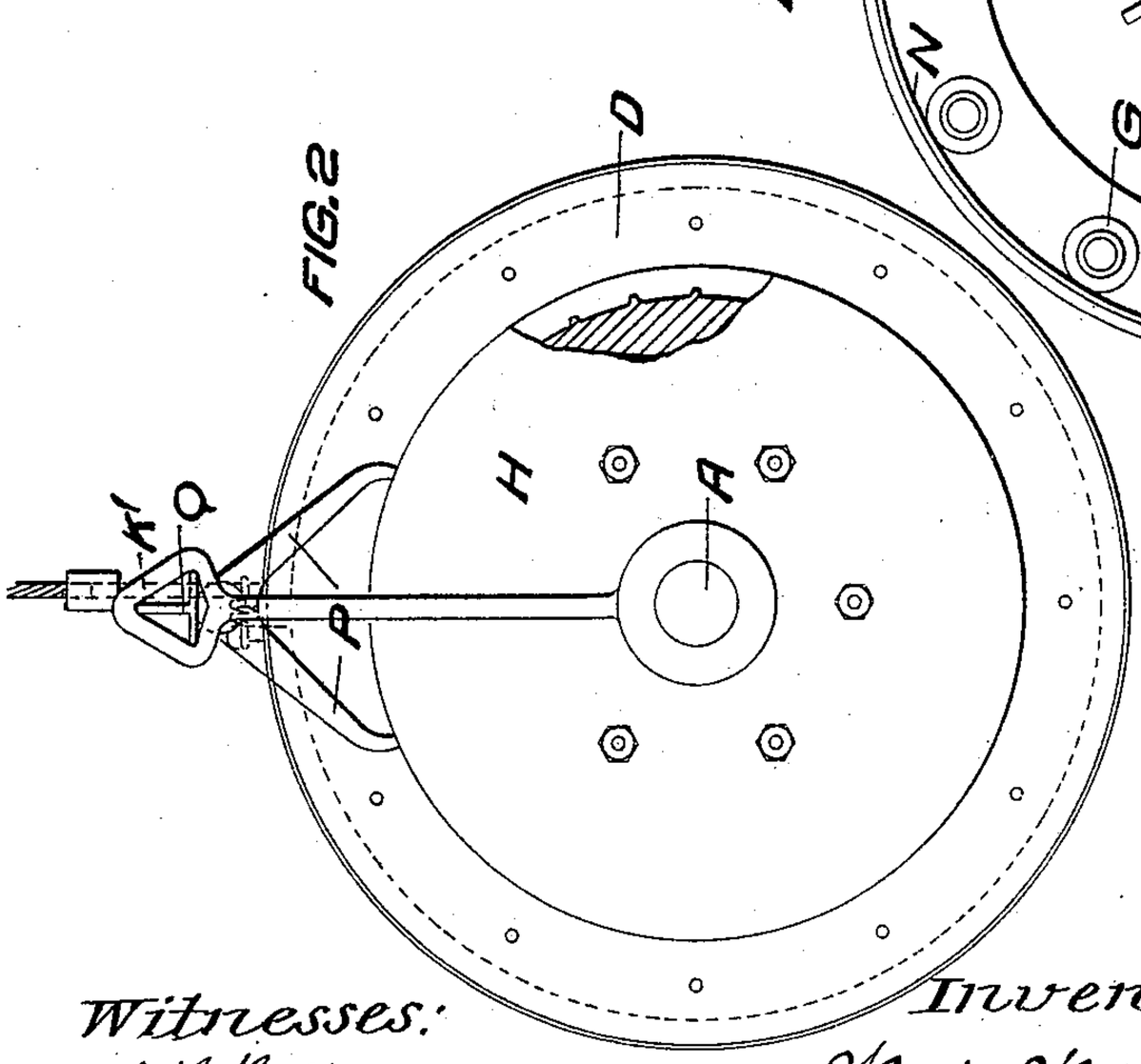

FIG. 2

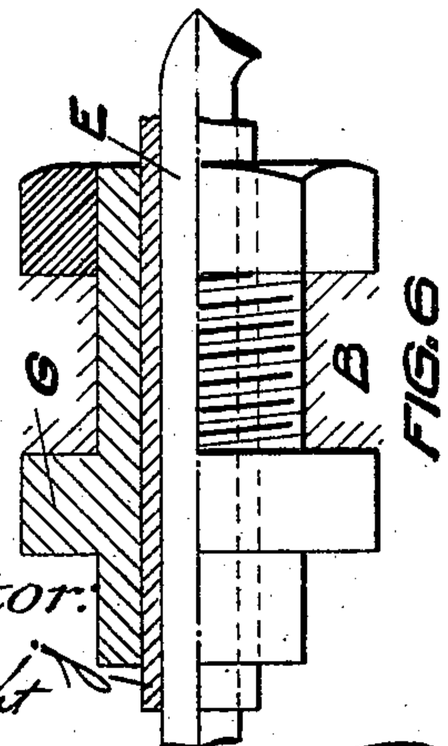

FIG. 6

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(No Model.) 4 Sheets—Sheet 3.

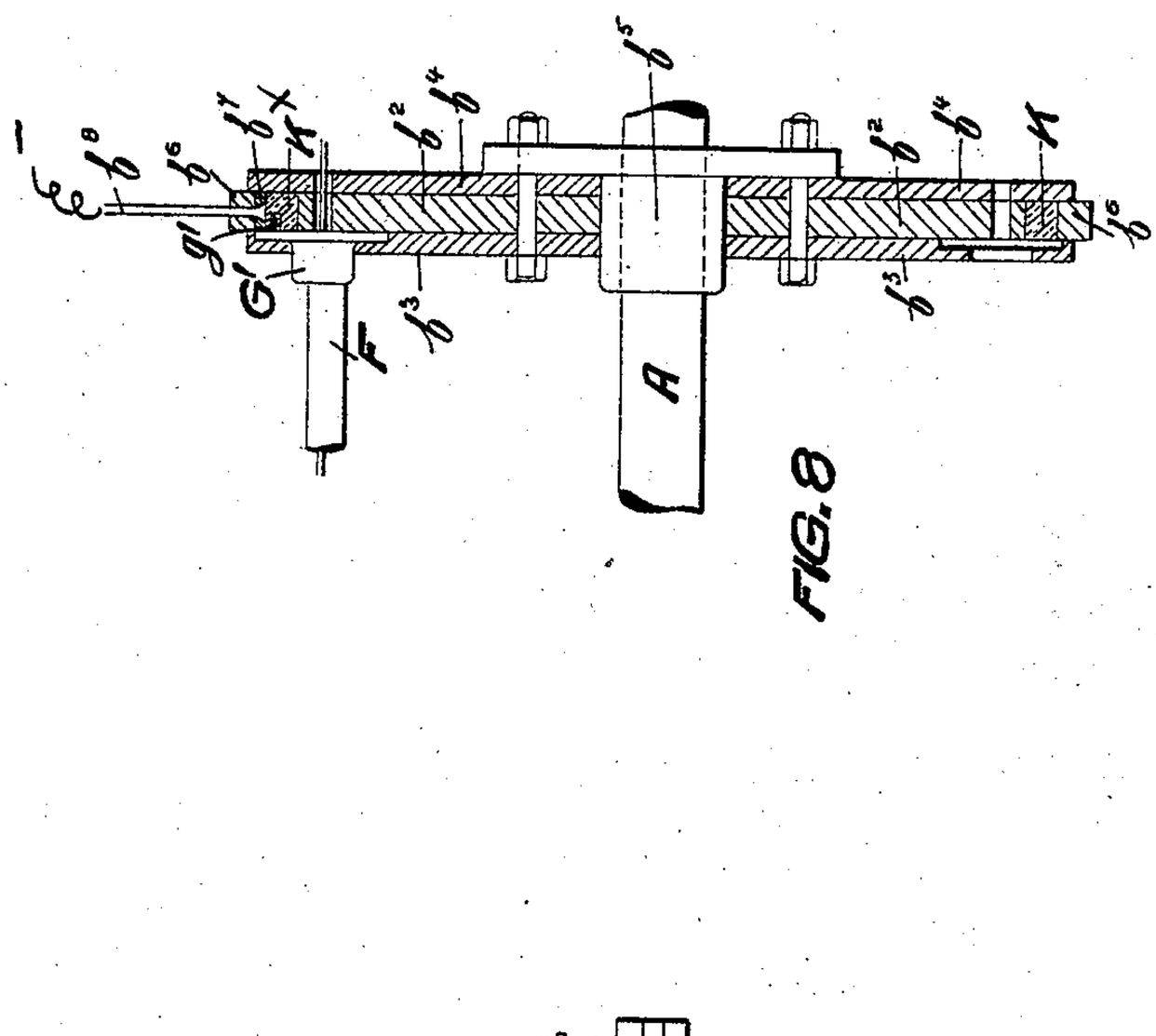

FIG. 8

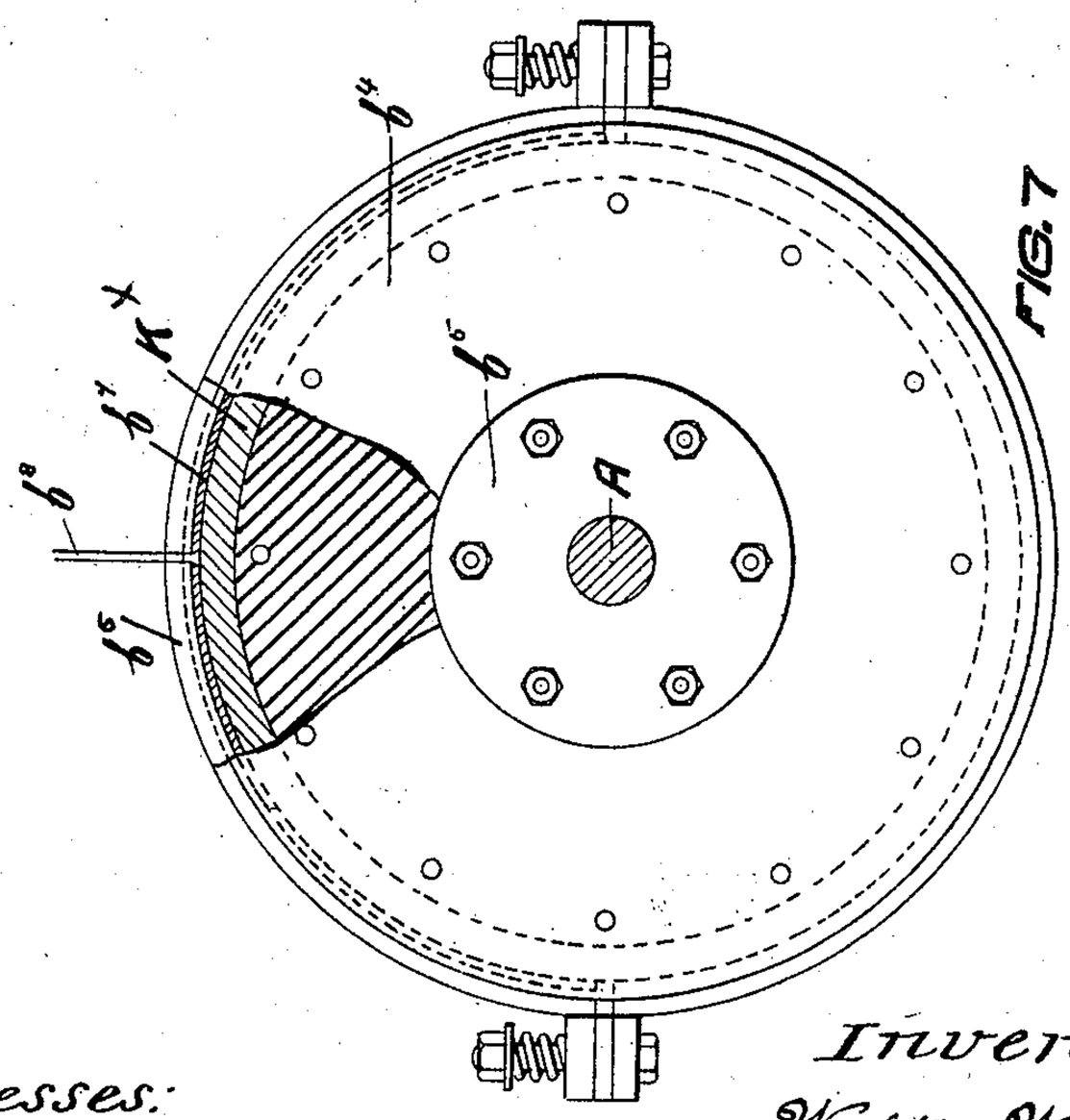

FIG. 7

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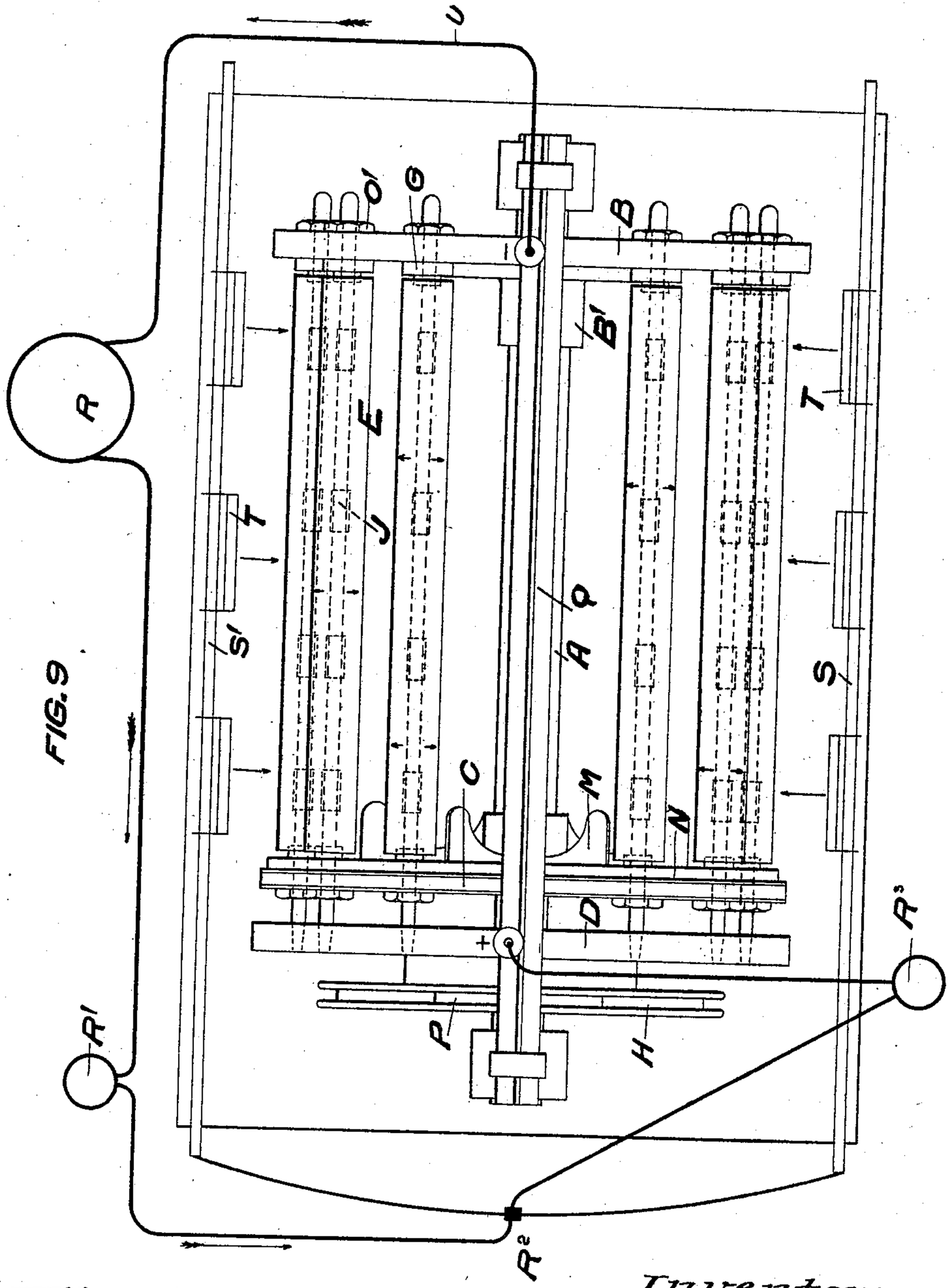
(No Model.) 4 Sheets—Sheet 4.

FIG. 9



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UNITED STATES PATENT OFFICE.

WALTER WRIGHT, OF ACOCKS GREEN, ENGLAND, ASSIGNOR TO THE STANDARD ELECTRO GALVANIZING COMPANY, LIMITED, OF BIRMINGHAM, ENGLAND.

APPARATUS FOR DEPOSITING METAL ON TUBES OR PIPES.

SPECIFICATION forming part of Letters Patent No. 615,940, dated December 13, 1898.

Application filed December 27, 1897. Serial No. 663,599. (No model.)

To all whom it may concern:

Be it known that I, WALTER WRIGHT, a subject of the Queen of Great Britain and Ireland, and a resident of Tranmere, Yardley road, Acocks Green, in the county of Worcester, England, have invented certain new and useful Improved Apparatus for the Deposition of Metal on Tubes or Pipes, of which the following is a specification.

This invention consists of improvements relating to the electric deposition of metal on pipes, tubes, and other articles, my object being to construct and arrange effective mechanical appliances upon which such articles can be readily mounted and be revolved in the plating solution for the purpose of coating them with zinc or other metal in a rapid and efficient manner.

In the four accompanying sheets of explanatory drawings to be hereinafter referred to, Figure 1 is a sectional side elevation illustrating my plating-machine or tube-frame; and Fig. 1ª, a plan of the same, but without any tubes in position. Fig. 2 is an end view of the disk carrying the anodes; Fig. 3, an end view of the intermediate tube-supporting disk, and Fig. 4 an end view of the negative tube-supporting disk. Figs. 5 and 6 are detail views, to a larger scale, showing, respectively, one of the spring-socket supports or carriers for the tube ends and the means employed for insulating the anode-rods. Fig. 7 is an elevation with part in section, and Fig. 8 an end view of the negative disk which I employ when using sockets for supporting the ends of the tubes. Fig. 9 is a plan showing the plating-machine or tube-frame in the bath of solution and with the anodes for the external coating in position.

The same reference-letters in the different views indicate the same parts.

In constructing an apparatus in accordance with my invention for coating tubes with zinc or other metal both externally and internally at one operation I employ a shaft or spindle, as A, carried by suitable bearings, and mount upon the same three built-up disks B, C, and D. The disks B and C support the tubes to be coated, while the disk D carries the anode-rods E for the internal coating of the tubes, each tube, as F, having one of such rods extending through its entire length. At Fig. 1 only one tube is shown in position. The complete apparatus, which I term a "tube-frame," may be made to receive any number of tubes of any length or gage.

The disks B C are adjustable, being made to slide upon the shaft A, and may thus be set in any required relative positions, by the set-screws *a* or by other means, to suit the length of the particular tubes to be mounted between them.

Upon the inner faces of the tube-supporting disks B and C, I mount sockets or hollow pins, arranging them concentrically around the disks for supporting the tubes to be operated upon. When employing sockets, I provide those at one end of the machine or upon one of the disks with an inner neck or projecting flange at the front and against which a spiral spring presses a brass or other washer.

In the enlarged sectional view at Fig. 5, F represents the end of one of the tubes to be plated, such end being supported by the socket or carrier G′, connected to the negative supporting-disk by the screws *g g′*. An elevation and a sectional end view of this disk to a smaller scale is shown at Figs. 7 and 8, respectively. The disk is built up from a central plate b^2 of ebonite or other insulating material and inner and outer plates b^3 and b^4 of the same material, such plates being bolted to the central cast-iron boss b^5. The copper conducting ring or rod $K^\times$ passes around the entire periphery of the central ebonite plate b^2, and on the upper half of such periphery, between the rod $K^\times$ and the upper half of the two-part insulating clamping-band b^6, I interpose the contact-piece b^7, through which the current passes from the rod $K^\times$ to the negative lead b^8. This lead, with the piece b^7, remains stationary in this instance. The current thus passes from the tube F through the socket G′ to the rod $K^\times$, and from thence to the contact-piece b^7 and the negative lead b^8.

To insert a tube in the frame, one end of the tube is pressed against the face of the said washer, which is thereby forced back a

sufficient extent to enable the opposite end of the tube to be placed in its socket on the other disk. The spring will then force the washer out to its normal position. The disks are so set or fixed upon the shaft that the space or distance between the sockets is rather less than the length of the tubes, and thus the latter cannot become detached until the spring-retaining washers are forced back, as described; but instead of such sockets and springs I preferably employ hollow gun-metal pins, as G, upon each of the disks B and C for supporting the tubes and to admit the anode-rods. The disks B and C are then set at such a distance apart and the pins G are of such length that when the tube F is placed over the larger diameter of one of the pins or the part adjacent to its disk the other end of the tube can be placed upon the opposite pin in the other supporting-disk. When in position, the tube rests upon the smaller part of each of its supporting end pins and is quite free to revolve thereon; but undue end movement is prevented by the shoulders formed by the junctions of the smaller and larger diameters of the pins.

As shown in the enlarged longitudinal section of one of the hollow metal supporting pins or carriers G, secured to the negative disk B at Fig. 6, the anode-rod E is insulated from the interior surface of the said pin by the rubber sleeve *j*. The hollow pins or carriers G for supporting the tube ends adjacent to the intermediate disk C are in like manner insulated from the anode-rods.

The shaft A is revolved, preferably, by means of a power-transmitting chain working over the chain-wheel H, keyed or secured to the shaft A, and as the tubes are loosely mounted in the sockets or on their supporting-pins they are free to revolve during the rotating movement of the complete frame, their rate of revolution or rotation being proportionate with the relatively-smaller diameter of the supporting-pins and the internal diameter of the tubes. Thus if a tube with an internal diameter of two inches rides upon pins of one-inch diameter the tube will make one revolution for every two revolutions of the frame. Such epicycloidal motion or independent revolution of the tubes during the rotary motion of the complete frame causes a continual change of surface to be presented to the anodes hung at the sides of the tank, thus insuring an equal deposition of metal over the whole surface of the tubes.

The cast-iron or other metal disk D is built upon the chain-wheel H, as illustrated at Fig. 1, being insulated from the wheel by sheets of gutta-percha or other insulating material.

Tapered holes are drilled within the disk D to receive the ends of the anode-rods E. The rods are prevented from touching the tubes by insulating-sleeves, as J.

In the negative disk B, Fig. 1, the supporting-pins are screwed directly into the circular cast-iron or other metal plate forming the central part of the disk, and are thus in good electrical connection with it. The plate is grooved around its periphery to receive a copper rod K for the conveyance of the negative current, such rod embracing the plate and being kept in contact therewith by the spring L, connecting the two ends. An insulating-band, as *b*, Fig. 3, is secured upon the exterior of the conducting-rod K, preferably by screws, as *b'*. The central metallic plate portion of the disk is insulated from the boss B', by which it is secured to the shaft A.

Referring to Figs. 1, 2, and 3, in the operation of the apparatus it will be understood that the disks revolve, while the conducting-bands K K' remain stationary and in contact with the peripheral portions thereof.

In the intermediate disk C the supporting-pins are insulated from contact with the rim or other metallic central plate by an insulating-sleeve and washers. On the inner face of this disk I attach a number of vanes, as M, so shaped and arranged that on revolving with the disk they throw out a stream of solution toward the tubes. Such stream or current is diverted by the rubber band N embracing the whole of the supporting-pins G of the disk D and caused to flow through the tubes, as indicated by the arrow at Fig. 1.

The anode-rods, as E, for the internal plating of the tubes are secured at one end within the tapered holes formed in the positive disk D, as described, and such disk is fitted with a conducting-rod K', arranged similarly to the rod K of the negative disk B. The opposite ends of the anode-rods are bent over at right angles and each rod is held by a clip, as O, arranged upon each of the supporting-pin lock-nuts O' on the outer face of the disk B.

When the plating is in progress, the revolving frame, with attached tubes, is submerged in the bath of solution.

Suitable lifting appliances are arranged in conjunction with my improved apparatus for the purpose of rapidly lowering the same into the bath and for withdrawing it therefrom.

The double pawl P, Figs. 1 and 2, pivoted upon the suspension-bar Q, arranged above the bath of solution, is for the purpose of sustaining the frame in a stationary position when necessary, the free ends of its arms being arranged to engage with the teeth of the chain-wheel H.

When requiring to plate tubes on the outside only, I use but two of the disks B and C, and in the construction of an apparatus to be used only for such exterior plating I mount only two disks upon the driving-shaft, one or both of such disks being adjustable to suit tubes of varying length. The tubes are supported on pins attached to the disks, such as hereinbefore described, permitting of ready attachment of the tubes and preventing accidental detachment of the same.

If the tubes are to be plated on the inside

only, I cover the entire outer surface of the frame and the tubes with a rubber sleeve or other insulating sheath or covering. Such covering may be formed as an extension of the band N, hereinbefore described.

I adapt my invention to the purpose of plating solid rods or bars or other solid or hollow articles.

The positive and negative connections are shown by the signs + and —, respectively, at Fig. 1. The course of the electric current through the machine is illustrated at Fig. 9, where R represents the dynamo in which the current is generated. From the dynamo the current passes in the direction indicated by the arrow to the ammeter at R′ and from thence to the shunt R^2. From the shunt R^2 a portion of the current passes to the rods S S′, carrying the anodes T, for the external coating of the tubes, while another portion passes to the ammeter R^3 and from thence to the anode-rods E for the internal coating of the tubes. The return-lead (indicated by the line U) completes the circuit. The various arrows in the illustration indicate the course of the current.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for the electrodeposition of metal on pipes, tubes, and other articles, the combination of a pair of revolving disks B and C each having a series of carriers fixed around their adjacent faces on which the tubes or other articles are supported and are independently rotatable as they revolve together with the disks, and the disk B forming a part of the circuit through which the electric current passes, with a revolving disk D carrying one end of the anode-rods E, such rods being further supported by the said disks B and C, substantially as set forth.

2. In an apparatus for the electrodeposition of metal on pipes, tubes, and other articles, the combination with the disk C and anode, of a revolving disk B having a series of carriers on which the tubes or other articles are supported and are independently rotatable as they together revolve with the disk, and a conductor K embracing the periphery of the disk B and having an electrical connection with the said carriers, substantially as set forth.

3. In an apparatus for the electric deposition of metal on pipes, tubes, and other articles, the combination with a cathode-support, of a revolving disk D carrying one end of the anode-rods E, and a conductor K′ embracing the periphery of the said disk D and having electrical connection with the said anode-rods, substantially as set forth.

4. In an apparatus for the electrodeposition of metal on pipes, tubes, and other articles, the combination with the revolving disks B, C, and D arranged in axial alinement, and the anode-rods E fitted with insulating-sleeves J and extending between the several disks, of clips as O arranged on the outer face of the disk B, the said disks being axially in line and the anode-rods extending from the disk D through the disks B and C, substantially as set forth.

5. In an apparatus for the electrodeposition of metal on pipes, tubes, and other articles, the combination with a revolving disk having carriers fixed concentrically around its inner face, of the vanes M on the face of the disk and rubber embracing-band N extending around the carriers, substantially as set forth.

6. The plating apparatus consisting of the suspended shaft A carrying the disks B and C adjustable toward and from each other on the said shaft and the driving-wheel H fixed on the said shaft with disk D attached thereto, with the double pawl P pivoted upon the suspension-bar Q and engaging the driving-wheel H, substantially as set forth.

7. In an apparatus for the electrodeposition of metal on pipes, tubes, and other articles, the combination with a revolving tube-supporting disk of anode-rods E carried by the disk and hollow metal pins G, each pin being secured in position on the disk by a nut and insulated from the anode-rod E passing through it by the sleeve *j*, substantially as set forth.

8. The apparatus for the electroplating of the exterior and interior surfaces of tubes, and like articles, consisting of the shaft A suspended in position to be submerged in a bath of metallic solution and carrying the adjustable disks B and C having carriers on which the tubes are supported and are independently rotatable as they together revolve with the disks, the driving-wheel H fixed to the shaft A, the disk D carrying one end of the anode-rods E such rods being further supported by the said disks B and C, and the anodes T, substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WALTER WRIGHT.

Witnesses:
EDWARD MARKS,
HERBERT BOWKETT.