(No Model.)

2 Sheets—Sheet 1.

C. M. BROWN.

PROCESS OF AND MACHINE FOR SOLDERING.

No. 485,906. Patented Nov. 8, 1892.

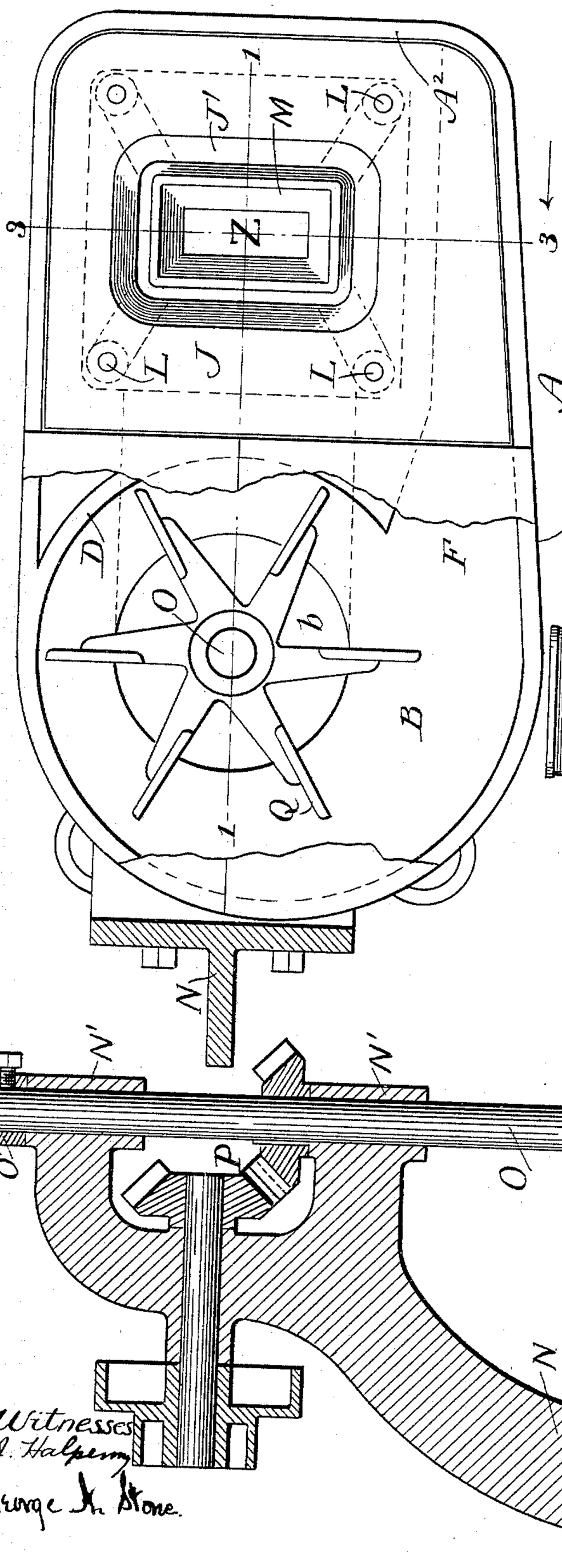

FIG. 2.

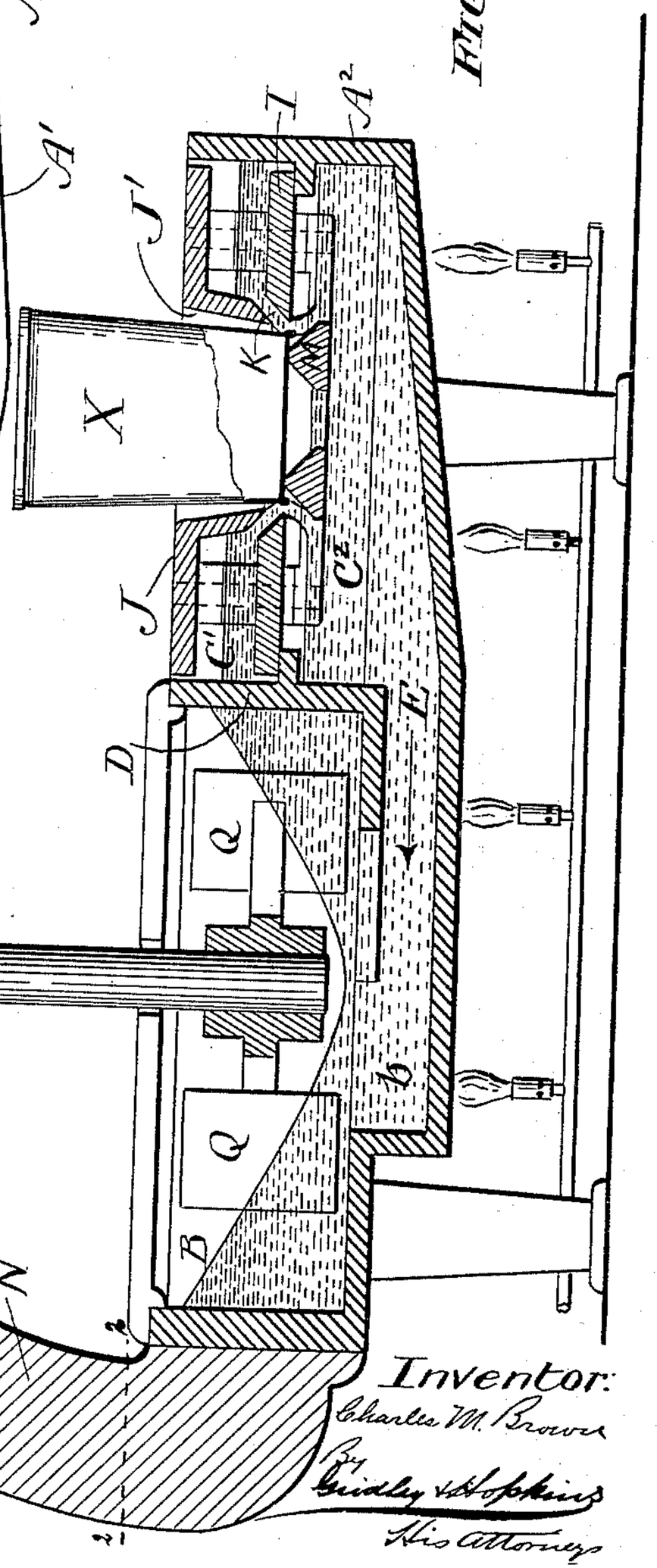

FIG. 1.

Witnesses
J. Halpern
George H. Stone.

Inventor:
Charles M. Brown
By Bradley & Hopkins
His Attorneys

(No Model.) 2 Sheets—Sheet 2.

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PROCESS OF AND MACHINE FOR SOLDERING.

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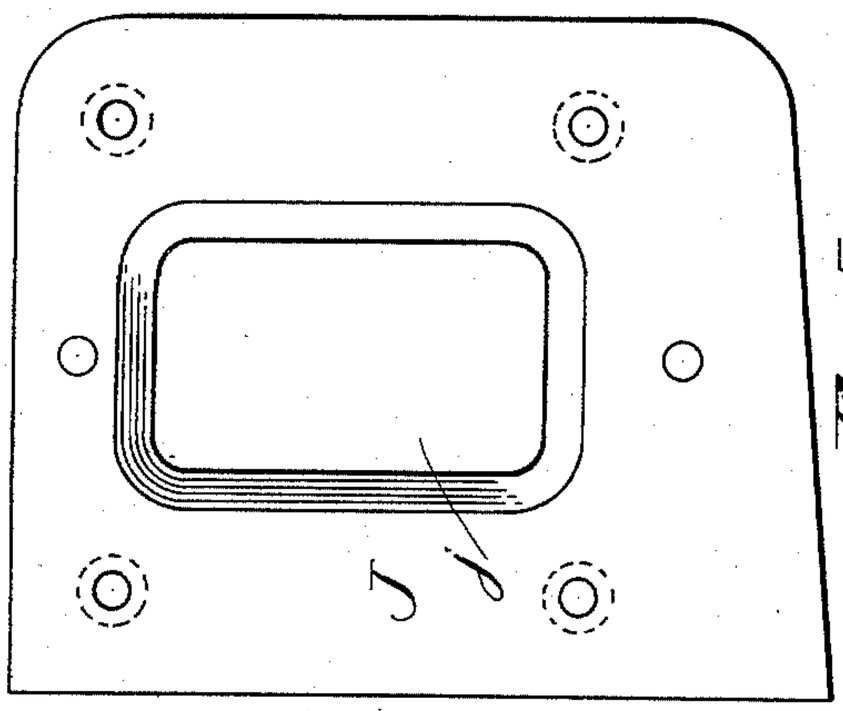

FIG. 5.

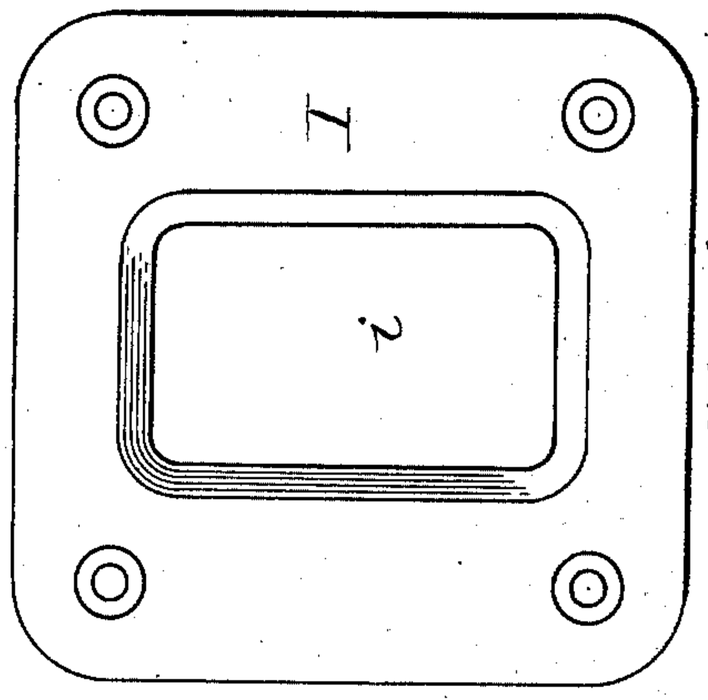

FIG. 6.

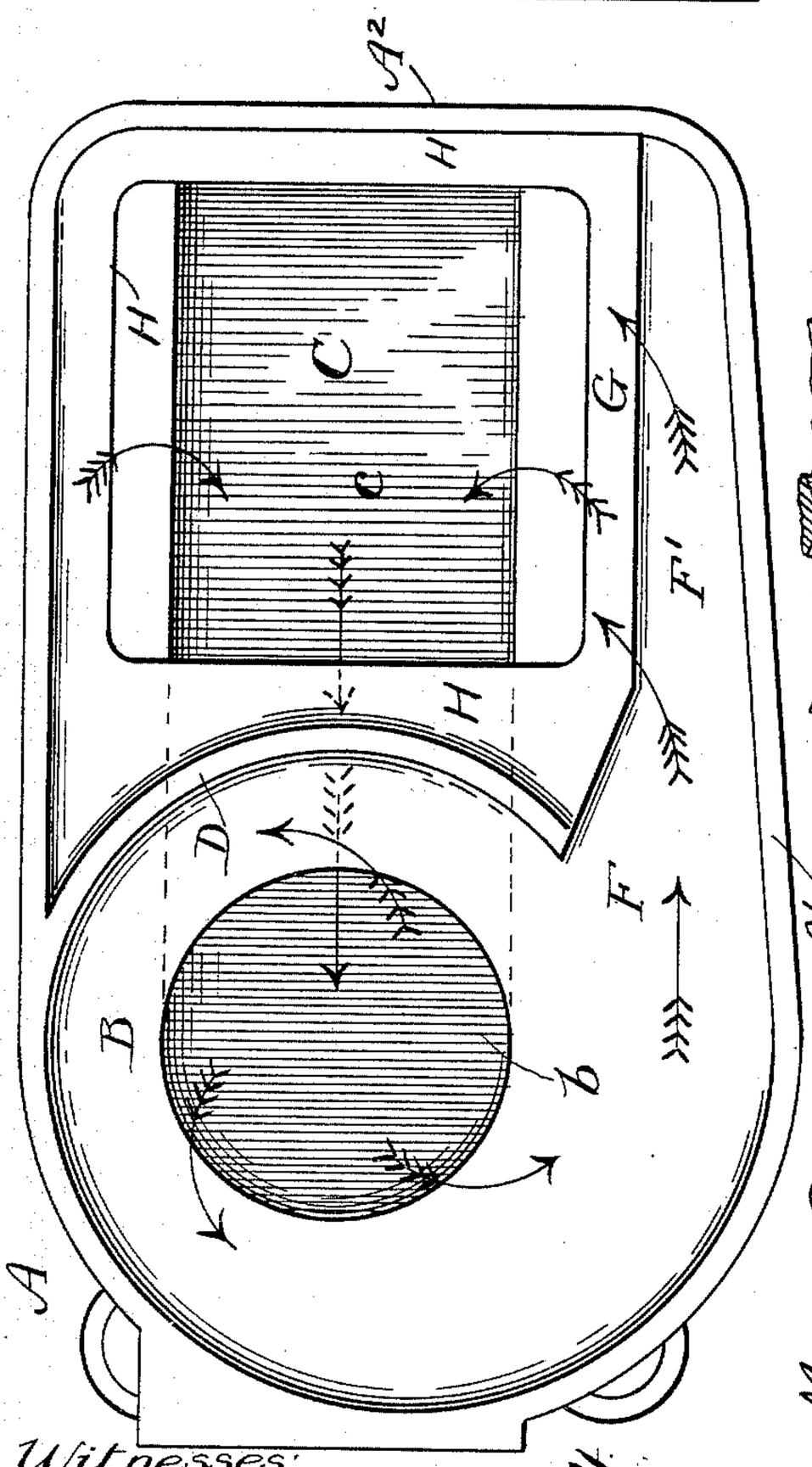

FIG. 4.

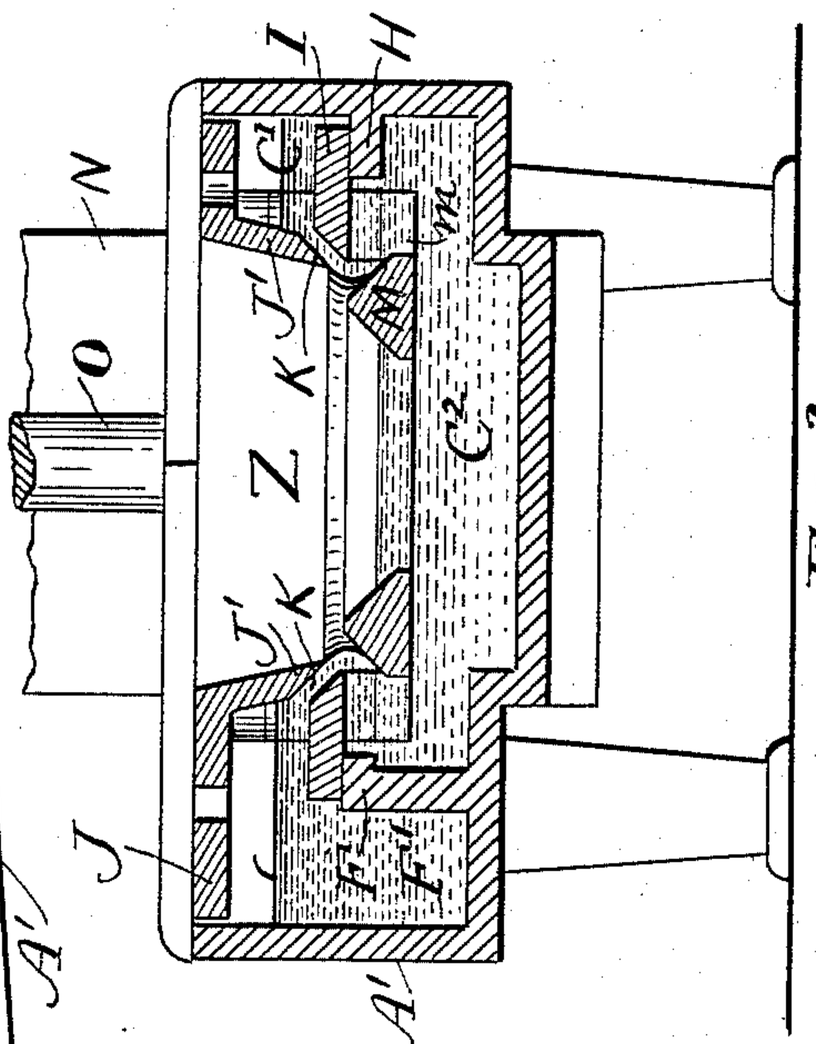

FIG. 3.

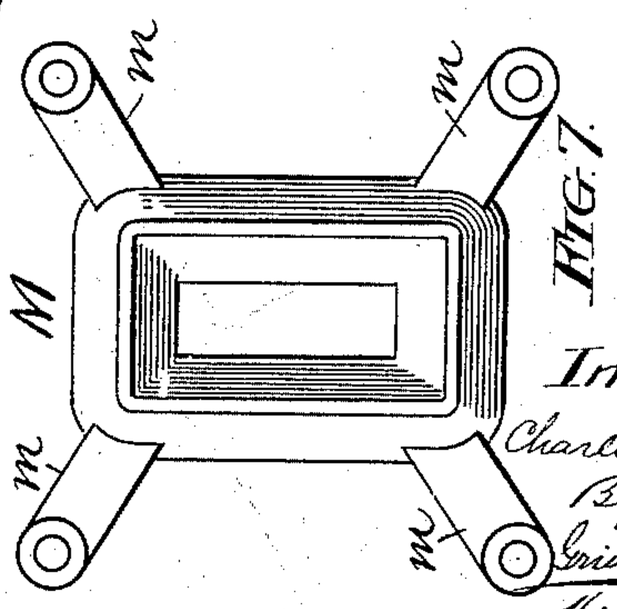

FIG. 7.

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UNITED STATES PATENT OFFICE.

CHARLES M. BROWN, OF CHICAGO, ILLINOIS.

PROCESS OF AND MACHINE FOR SOLDERING.

SPECIFICATION forming part of Letters Patent No. 485,906, dated November 8, 1892.

Application filed December 19, 1891. Serial No. 415,623. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. BROWN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Process of and Machines for Soldering, of which the following is a specification.

The object of the present invention is to provide a process and machine by which soldering may be done more rapidly than according to old methods and with old machines.

According to my invention I keep the molten solder in motion, and, furthermore, I cause its surface, into which the joint is immersed, to assume a sloping instead of a horizontal position, for a reason that will appear presently.

The invention consists in certain features of novelty that are particularly pointed out in the claims; and in order that said invention may be fully understood I will proceed to describe it with reference to the accompanying drawings, which are made a part of this specification, and in which—

Figure 1 is a vertical longitudinal section of an improved machine for carrying out the improved process, the cutting-plane being indicated by the line 1 1, Fig. 2. Fig. 2 is a horizontal section thereof on the line 2 2, Fig. 1, the parts below the cutting-plane being shown in plan. Fig. 3 is a vertical transverse section thereof on the line 3 3, Fig. 2, looking in the direction of the arrow, the upper part of the driving-shaft and its accessories being omitted. Fig. 4 is a plan view of the solder-receptacle. Figs. 5, 6, and 7 are plan views of parts hereinafter fully described.

The solder-receptacle consists of a shallow pan A, divided into two main compartments B and C by a partition D. The compartment B is preferably circular, and in its floor is a centrally-located opening *b*, which is connected by a passage E, situated beneath the floor, with an opening *c* in the floor of the compartment C. The partition D terminates some distance from the side wall A′, leaving an opening F, and from its end a lower partition G extends to the end wall A^2, forming, with the side wall A′, a channel F′. Projecting inwardly from the walls of the compartment C, with its top side preferably flush with the top of the partition G, is a flange or shoulder H, upon which rests a plate I, that divides the compartment C horizontally into two chambers C′ and C^2, the partition being provided with an opening *i*.

J is a plate situated above the plate I and having an opening *j*, from the margin of which a flange J′ extends downward nearly to the plate I, forming an interior wall for the chamber C′ and leaving a narrow opening K, the opposing edges of the two plates being preferably chamfered in such a way that the opening K flares upward and outward.

M is a stop or rest situated opposite the opening *i* and with its upper side slightly below the channel K, and consisting, preferably, of an open rectangular frame having arms *m*, perforated for the reception of rivets L, by which the parts I, J, and M are secured together, so that they can be lifted out of the compartment C.

It will be seen that, as shown in the drawings, the flange J′ is, in fact, supported by the plate I; but, if desired, the support may be more direct, and the portion J, which forms only a cover for the chamber C′, may be dispensed with, the object of the construction being to provide a chamber for the solder having a vertical opening Z for the article and an opening into said opening, through which the solder is discharged.

N is an arm secured to and projecting upward from the pan A, and O is a vertical shaft journaled in bearings N′ and sustained by a collar O′, bearing upon the top of the arm. Suitable gearing P is provided for driving the shaft, and to said shaft is secured a wheel or stirrer Q, situated in the compartment B.

The operation of the machine is as follows: A suitable quantity of solder is put in the receptacle A and kept in a molten state by a Bunsen burner placed beneath it or by any other desired means. The stirrer Q is then put in motion, and as the molten solder in the compartment B partakes of this motion centrifugal force will cause its surface to assume a concavity such as indicated in the drawings, thereby raising the level of the solder at the circumference of the compartment and lowering it at the center. The solder will flow through the opening F into passage F′ and over the plate I until it is about the same

level in chamber C′ as it is in compartment B. From the chamber C′ it will flow through the opening K into the chamber C^2, and so long as the solder in compartment B opposite the opening *b* is kept at a lower level than the solder in the chamber C^2 the solder will flow from said chamber C^2 through the passage E and into compartment B. In this way a circulation is kept up in the directions indicated by the arrows. If desired, the passage F′ may be dispensed with and the partition D provided with an opening or terminated at such height that the solder will flow directly from the upper part of compartment B to chamber C′. I prefer, however, to use said passage, because, being located tangentially to the compartment B, the molten solder will be driven into it by centrifugal force and the circulation thereby aided. It will be seen that the passage E, the compartment B, the stirrer Q, and their accessories are simply means for taking the molten solder from the lower chamber C^2 and returning it to the higher chamber C′, and I desire to have it understood that in its generic sense my invention is not limited to these or any other particular means for accomplishing this result.

With this machine the operation of soldering is accomplished by inserting the article in the vertical opening Z of the solder-chamber C′ until the joint to be soldered comes in contact with the stream of solder issuing from the solder-opening K.

The opening Z should be of the same shape as the article to be soldered, while its size should be such that the article may be rested on the stop M, and when so rested all parts of the joint to be soldered will project into the stream of solder issuing from the passage K. In the drawings the opening is rectangular, (substantially,) and in Fig. 1 is shown a can X, of corresponding shape, resting upon the stop M in position to have its bottom soldered on; but for a round article the opening should be round, so as to give the stream of solder a round contour, and for a star-shaped article the stream should be star-shaped, and so on. It is easily possible to give the stream of solder the necessary shape for simultaneously soldering a continuous joint of an article of any outline by simply giving the inner wall J′ of the solder-chamber and the solder-discharge opening K the proper shape.

According to one old method of soldering, a small quantity of solder is placed upon a horizontal disk, which is slightly concave on top, and beneath which are the burners. The article is immersed in the solder until it comes in contact with the disk and is so held for an instant, the disk being slowly revolved the while. This machine is, in fact, a rotary soldering-iron, and its operation depends upon actual contact of the article with the disk. It can be used only on round articles, and the disk cannot be revolved fast enough to give the surface of the solder the necessary concave form or slope. Consequently unless the end of the article is countersunk its entire surface will be coated with solder if the quantity used is anything more than barely enough to give the disk a mere coating. Furthermore, it is available only when the seam or joint is at the very extremity of the body of the article, and cannot be used where the seam is on the side.

The advantages of my method are that it can be used on articles of any shape having side seams or end seams, countersunk ends or flat ends. So far as I am aware I am the first to solder by immersing the entire joint of the article simultaneously in a bath of moving molten solder the surface of which is made to slope, so that the entire bottom of the article does not come in contact with the solder. I have shown and described in this application means for accomplishing these results and applying the principles which they involve in soldering articles of any shape, be it curved or angular, regular or irregular, and I believe said means to be the best that can be devised for performing these operations where the article is other than round; but for round articles I prefer to use the machine shown in another application of even date herewith, Serial No. 415,624. In the machine shown in said application the molten solder is contained in a cup, which is revolved about a vertical axis, so that the centrifugal force causes the surface to assume a concave form. Both of these machines keep the solder in motion and cause its surface to slope; but the character of the motion and slope differ somewhat.

My invention as herein claimed includes both, however, and others that will readily suggest themselves to a skilled mechanic.

I am aware that it is not new to melt the solder and cause a quantity just sufficient to seal the joint to flow from a higher to a lower level and into said joint; but this is not the equivalent of causing the melted solder to fall in a copious stream (the quantity being more than is actually required for sealing the joint) and immersing therein the joint to be sealed, the surplus solder that is allowed to fall being returned.

What I claim as new is—

1. The process of soldering consisting in forming a bath of molten solder, imparting to it a swift motion, and causing its surface to slope to such an extent that an article having a flat unsunken bottom may be immersed therein far enough to submerge either a bottom seam or a side seam without bringing any considerable portion of its bottom in contact with the solder, and immersing in the sloping surface of the moving molten solder the article to be soldered until its joint is submerged, but without bringing any considerable portion of its bottom in contact with the solder, substantially as described.

2. The process of soldering consisting in forming a bath of molten solder, imparting to it a swift motion, and causing its surface

to assume a concave form and to slope to such an extent that an article having a flat unsunken bottom may be immersed therein far enough to submerge either a bottom seam or a side seam without bringing any considerable portion of its bottom in contact with the solder, and immersing in the sloping concave surface of the moving molten solder the article until the entire joint to be soldered is simultaneously submerged, but without bringing any considerable portion of the bottom in contact with the solder, substantially as described.

3. In soldering machinery, means for causing the molten solder to circulate in a continuous current, in combination with means for supporting the article to be soldered and presenting the seam to be soldered only in contact with the said current, whereby a portion of the latter seals the joint, substantially as set forth.

4. In soldering machinery, in combination, means for causing the molten solder to circulate in a continuous current, means for causing the said current to fall from a higher to a lower level at one part of its circuit, and means for supporting the article to be soldered and presenting the seam to be soldered to the soldering-current as it descends from the higher to the lower level, whereby the requisite portion of the solder is absorbed and seals the joint, substantially as set forth.

5. The process of soldering consisting in melting the solder, causing a greater quantity than is required for sealing the joint to flow from a higher to a lower level in a continuous stream the shape of which in horizontal cross-section corresponds to the outline of the joint to be sealed and immersing the joint to be sealed in the solder as it falls in a stream from the higher to the lower level, so that all parts of said joint are simultaneously brought in contact with the solder, substantially as herein described.

6. A soldering-machine having, in combination, two chambers, an opening through which solder flows from one chamber into the other, the bottom of the chamber into which the solder flows being located below the level of the opening, so that the solder flowing therefrom falls in a stream, and means for taking the solder from the lower chamber and returning it to the upper one, substantially as set forth.

7. In a soldering-machine having, in combination, the chamber C′, the opening Z, extending vertically through said chamber and adapted to admit the article to be soldered, and the solder-discharge opening K near the bottom of said opening, substantially as set forth.

8. In a soldering-machine, the combination, with the compartment C, of the horizontal partition I, dividing it into upper and lower chambers C′ and C^2, and having the opening *i* and the flange J′, extending upward from the partition I, and leaving the solder-discharge opening K, substantially as set forth.

9. The combination, with the chamber C′, having the vertical opening Z and the solder-discharge opening K, communicating with said opening, of a stop situated opposite and below the opening Z for limiting the insertion of the article, substantially as set forth.

10. The combination, with the compartment C, of the horizontal partition I, dividing it into chambers C′ and C^2, and having opening *i*, through which said chambers communicate, and the plate J, having opening *j* for admitting the article, and flange J′, projecting downward toward the partition I, leaving the opening K, through which solder flows from the chamber C′, substantially as set forth.

11. The combination, with a chamber having the vertical opening Z for receiving the article to be soldered and the solder-discharge opening K, communicating with said opening Z, of a stop for limiting the insertion of the article, situated opposite and below the opening Z, and consisting of open frame M and means for supporting it, substantially as set forth.

12. The combination, with the compartment C, of the horizontal partition I, having opening *i*, the plate J, supported by said partition and having opening *j* and flange J′, extending downward and leaving opening K, and the rest M, having arms *m*, secured to the partition I, substantially as set forth.

13. The combination, with the chamber C′, having a solder-discharge opening K, and the chamber C^2, having its bottom located below said opening, so that the solder flowing therefrom falls in a stream, of the compartment B, passages connecting it with both of said chambers, and means in said compartment for forcing the solder into the upper chamber C′, whence it flows through the opening K back to the lower chamber C^2, substantially as set forth.

14. The combination, with the upper chamber C′, having a solder-discharge opening, and the lower chamber C^2, of the compartment B, passages connecting it with both of said chambers, and a rotary stirrer in said compartment, substantially as set forth.

15. The combination, with the chamber C′, having a discharge-opening, and the lower chamber C^2, of the compartment B, having a centrally-located opening in the floor thereof, a passage connecting said opening with the compartment C^2, a passage connecting the compartment B and chamber C′, and means for producing a rotary motion of the solder in said compartment, substantially as set forth.

16. The combination, with the chamber C′, having a discharge-opening, and the lower chamber C^2, of the compartment B, a passage extending tangentially from the compartment B and communicating with chamber C′, a passage connecting said compartment and the

lower chamber C^2, and a rotary stirrer in said compartment, substantially as set forth.

17. The combination of the receptacle A, having transverse partition D and longitudinal partition G, forming compartments B C and passage F′, and the openings *b* and *c* in the floors of said compartments, respectively, the passage E, connecting said openings, the horizontal partition I, dividing compartment C into upper chamber C′ and lower chamber C^2, and having opening *i*, the flange J′, extending upward and leaving opening K, and means for causing the solder to flow from compartment B into passage F, thence into chamber C′, thence through opening K into chamber C^2, and thence through passage E back to compartment B, substantially as set forth.

CHARLES M. BROWN.

Witnesses:
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J. HALPENNY.