Sept. 4, 1928. 1,683,129

H. J. GAISMAN ET AL

METAL TEMPERING APPARATUS

Original Filed June 28, 1923 4 Sheets-Sheet 1

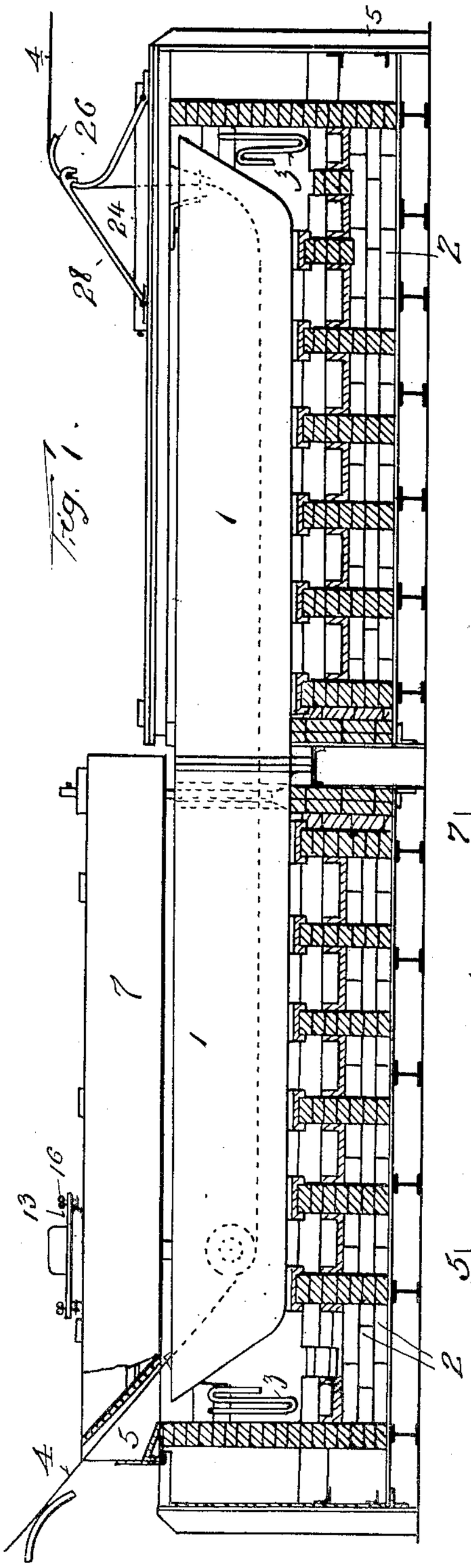

Fig. 1.

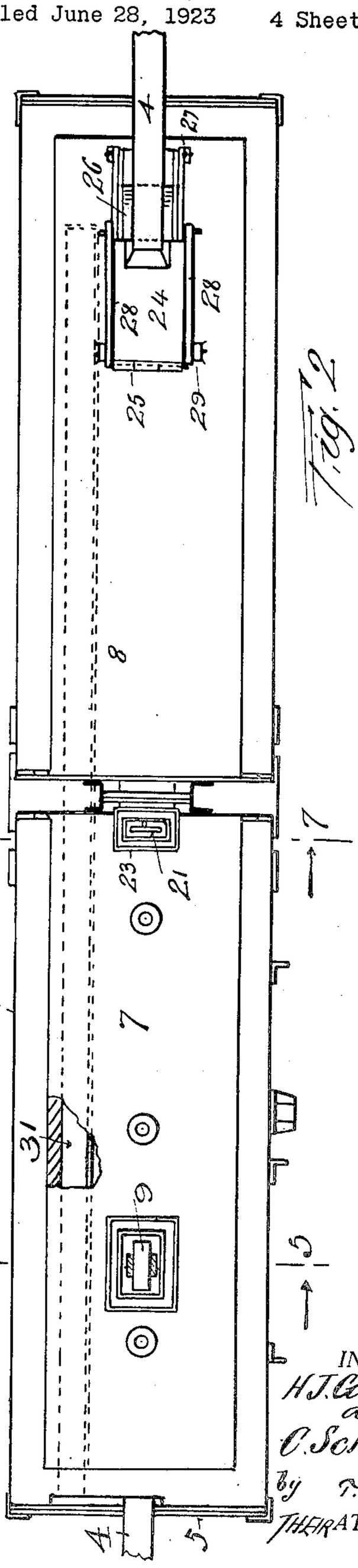

Fig. 2.

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METAL TEMPERING APPARATUS

Original Filed June 28, 1923 4 Sheets-Sheet 2

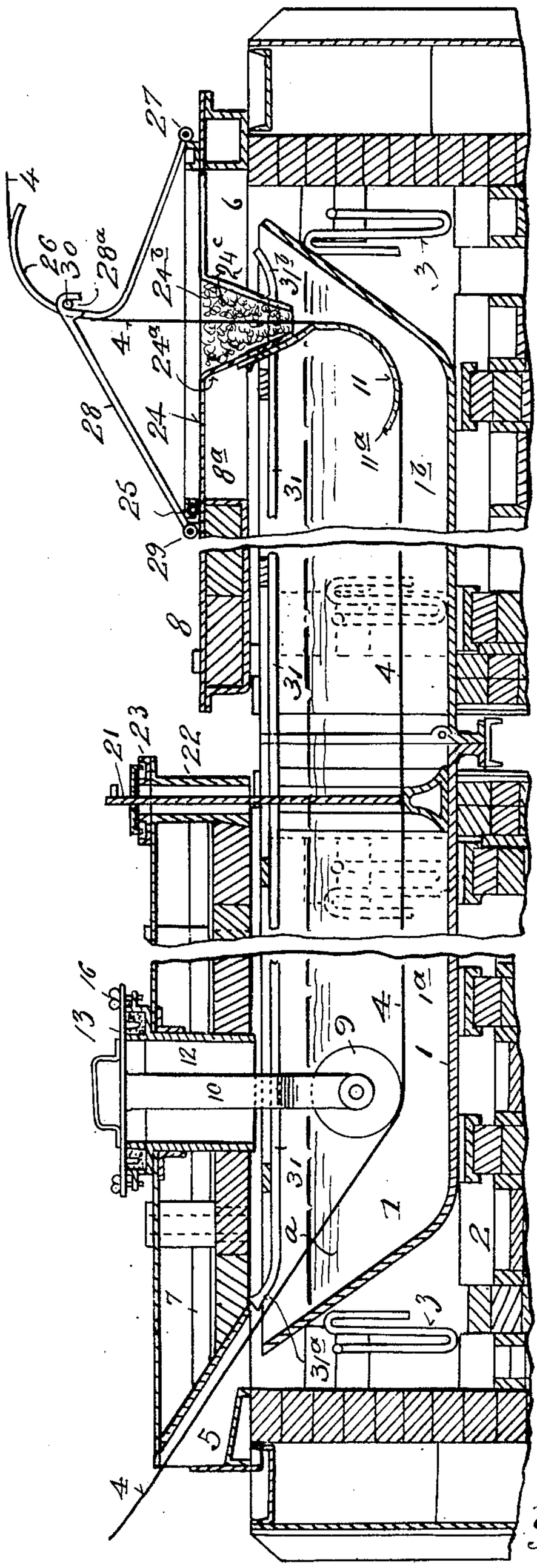

Fig. 3.

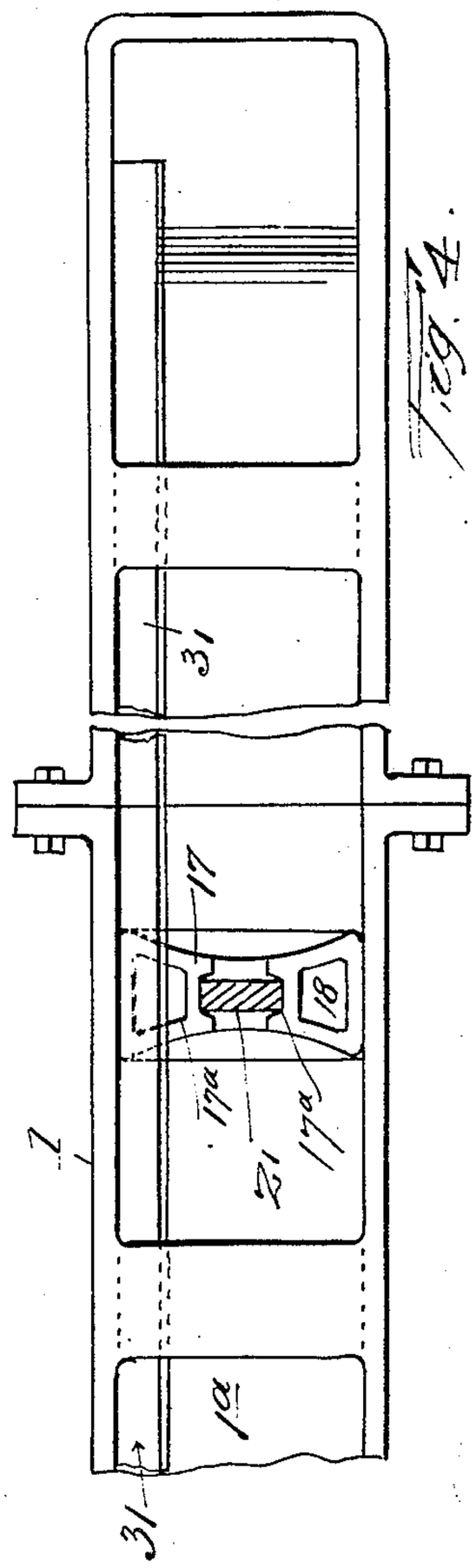

Fig. 4.

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Fig. 6.

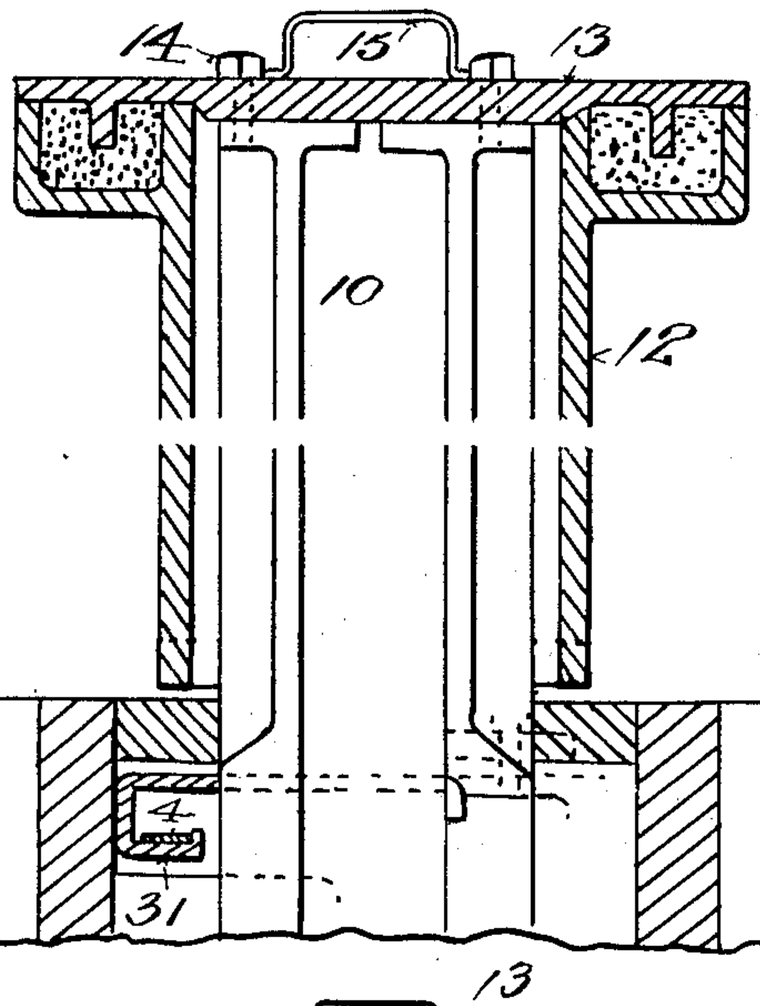

Fig. 5.

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Original Filed June 28, 1923

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Fig. 8.

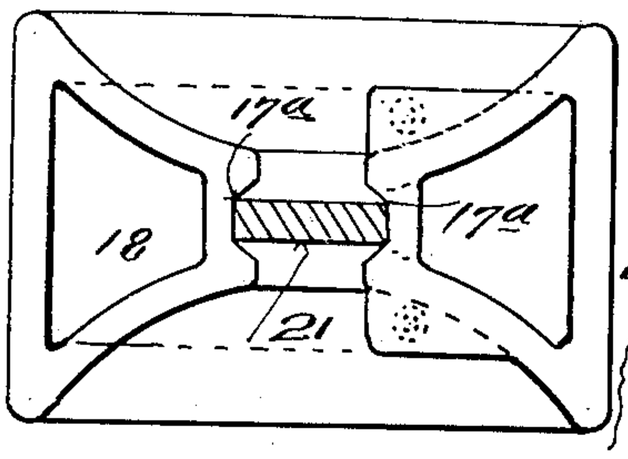


Fig. 10.

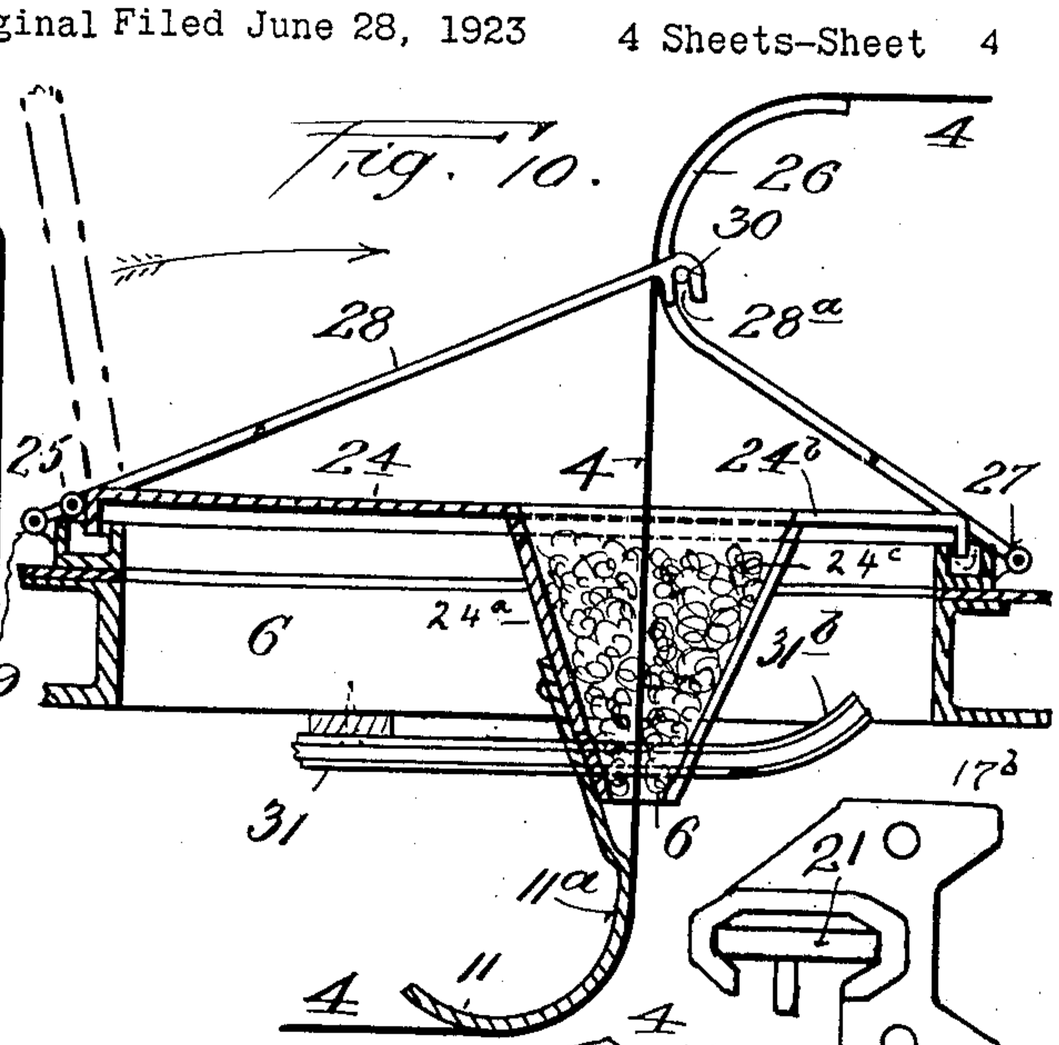
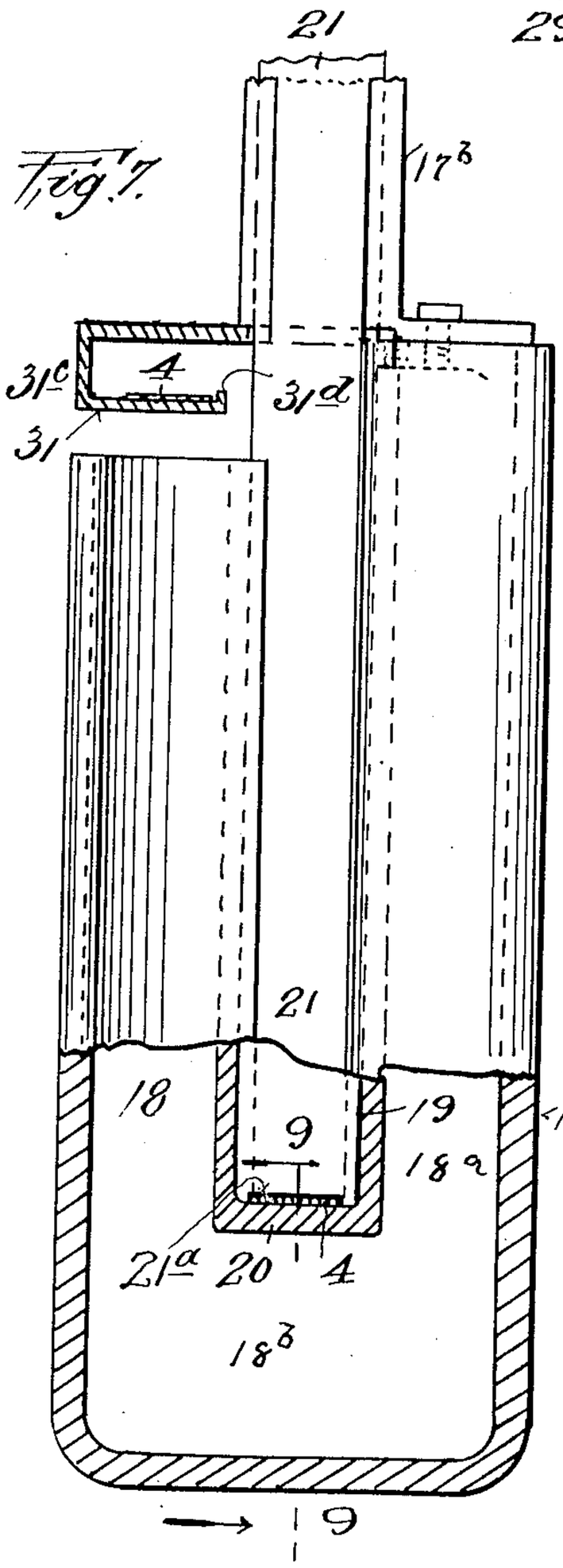


Fig. 7.



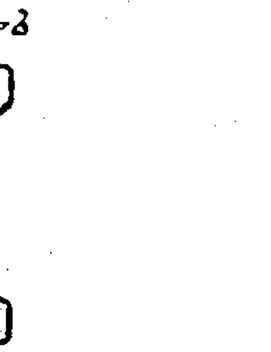


Fig. 12.

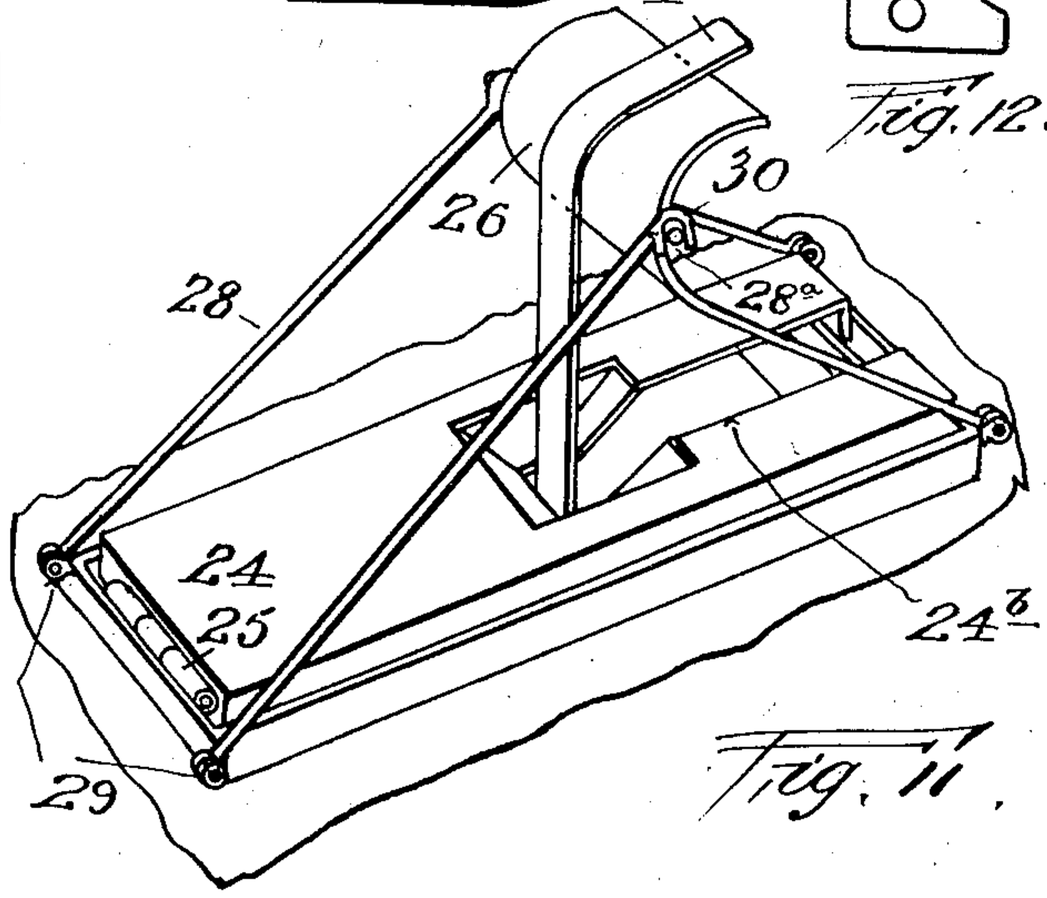
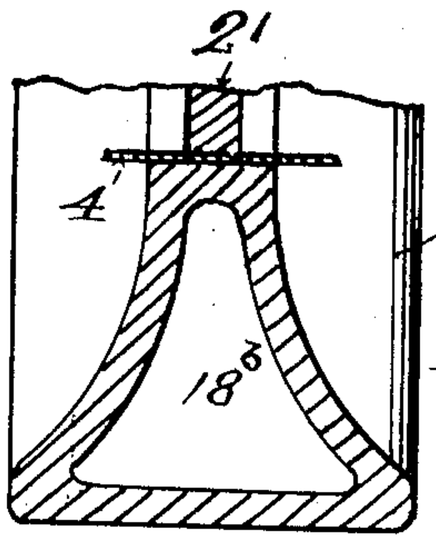


Fig. 11.

Fig. 9.



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Patented Sept. 4, 1928. 1,683,129

UNITED STATES PATENT OFFICE.

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METAL-TEMPERING APPARATUS.

Application filed June 28, 1923, Serial No. 648,175. Renewed February 4, 1928.

The object of our invention is to provide improved means to harden or temper relatively long lengths of strips of steel in a continuous passage of the steel through a heated tempering medium, in order that all parts of the steel strip may be given an equal degree of hardness or temper as nearly as possible.

In carrying out our invention we provide a tank or bath preferably having a plurality of chambers containing a tempering medium, such as lead, maintained at different temperatures, with means to insert a strip of steel in the tank or bath while the latter is heated and guide said strip properly as it is drawn through the heating medium.

Our invention comprises novel details of improvement that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part hereof, wherein

Fig. 1 is a partly sectional side elevation of a tempering apparatus embodying our invention;

Fig. 2 is a plan view;

Fig. 3 is an enlarged vertical section;

Fig. 4 is a detail plan view;

Fig. 5 is an enlarged detail cross section on line 5, 5, in Fig. 2;

Fig. 6 is an enlarged detail of part of Fig. 5;

Fig. 7 is an enlarged partly sectional detail on line 7, 7, in Fig. 2;

Fig. 8 is a plan view of Fig. 7;

Fig. 9 is a detail section on line 9, 9, in Fig. 7;

Fig. 10 is an enlarged sectional detail at the strip delivery end of the apparatus;

Fig. 11 is a perspective of parts shown in Fig. 10, and

Fig. 12 is a detail.

Similar numerals of reference indicate corresponding parts in the several views.

At 1 is indicated a tank or bath shown in relatively narrow elongated form to contain a heating or tempering medium, such as molten lead. The tank 1 may be heated in any suitable way, the same being shown enclosed within a casing at 2 in which heating units 3 of an electrical heating system of any suitable character may be enclosed. At 4 is indicated a strip of steel or other suitable material to be hardened or tempered which may be supplied upon a coil supported in any suitable way. A guiding entrance for strip 4 is indicated at opening 5 and an outlet for the strip from the tank is indicated at opening 6. A suitable covering for the tank is shown at 7, 8, adapted to rest upon the casing or brickwork 2 to close the tank and retain heat as much as possible. A guide is indicated at 9 for the portion of the strip 4 as it enters the tank, said guide being shown in the form of a roller carried by an adjustable bar 10, and at 11 is a guide for the portion of strip about to pass from this tank adjacent to the outlet 6. The parts 9 and 11 keep the strip 4 depressed within the heating medium in the tank and guide the strip in its passage through the tank. The parts 9, 10 and 11 are adjustable in and out of the heating medium *a* to engage the strip above said medium when the strip is first positioned in the tank and to depress the strip into the heating medium and retain it there as the strip is drawn through the tank. In order to permit adjustment of guide 9 and its bar 10 up and down and prevent the escape of heat the cover 7 is shown provided with a tube 12 on which a cover plate or cap 13 is adapted to rest and to which cover the bar 10 is secured, (Figs. 5 and 6), as by screws 14. A hand grip 15 enables the cover to be raised and lowered with bar 10 and roller 9. By means of screws 16 the cover 13 may be detachably secured upon cover 7.

The tank 1 is shown divided into a plurality of chambers 1^a, 1^b, the heating medium or lead *a* being retained in chamber 1^a at a higher temperature than the heating medium or lead in chamber 1^b, so that the strip 4 will be heated to its highest temperature as it passes through chamber 1^a and its temperature will be gradually reduced as it passes through chamber 1^b. Between the chambers 1^a, 1^b is a wall 17 fitted within tank 1. The wall 17 is shown comprising a suitable casting having a vertically disposed air passage comprising two vertical hollow legs 18, 18^a connected by a cross passage 18^b, providing an interior guideway or space 19 between said legs closed at its bottom by the wall 20, (Fig. 7). A partition or guide bar 21 for the strip is vertically adjustable in guiding grooves 17^a along the inner walls of legs 18, 18^a, which partition acts as a dam

between the chambers 1^a and 1^b. The strip 4 is adapted to pass through the guideway or space 19 in wall 17 and to be engaged by the lower end of partition 21 when the latter is pushed down in such space, the lower end of said bar being shown recessed at 21^a to receive and guide said strip, (Fig. 7). A guide 17^b on wall 17 guides partition 21, (Figs. 7 and 12). A tube 22 on the cover 7 receives partition 21 and a cap 23 upon said tube is attached to the partition serving to prevent the escape of heat and to permit the partition to be raised when a strip 4 is to be inserted in the tank, (Fig. 3).

The cover 8 is shown provided with a movable closure or trap at 24 at the outlet 6 and which carries the depending funnel-like member 24^a, said closure 24 being shown pivoted upon cover 8 at 25 to be operative respecting the opening 8^a of the cover 8. The closure 24 normally rests upon the cover 8 and may be raised when it is desired to insert a strip in the tank. The guide 11 is carried by closure 24, being shown in the form of a strip of metal secured to the funnel 24^a and depending therefrom in downwardly convexed or curved form at 11^a to serve as a curved guide for strip 4 as the latter is drawn through the tank. An outlet guide is shown at 26 above the closure 24 and convexly curved in a direction opposite to the position of guide 11, over which guide 26 the strip 4 passes from guide 11 as it emerges through the opening 24^b of closure 24. Said opening is shown extended through the adjacent end of closure 24 so that the closure may be raised and lowered respecting strip 4. The guide 26 is pivotally attached to closure 24 at 27 so that said guide may be swung aside when the strip is being adjusted. A latch 28 pivotally supported on closure 24 at 29 is adapted to engage guide 26 to retain the latter in operative position. The latch 28 is shown provided with a notched part 28^a to engage pin or projection 30 on guide 26 to retain the latter in operative position. The funnel-like member 24^a is preferably packed with asbestos wool or analogous material 24^c, through which the strip 4 slides, to cause the heating medium or lead that may adhere to the strip to be scraped therefrom before the latter emerges from the bath and becomes cooled.

In order to permit the strip 4 to be inserted in the bath of molten metal in tank 1 without removing the covers 7 and 8, so that heat from the tank will not be lost, we provide guiding means for the strip within the tank at its upper portion, preferably above the level of the molten metal, and at one side of the plane of the strip guiding means 9, 21 and 11. We have shown a track or way 31 extending longitudinally within the tank shown having the receiving end upturned at 31^a adjacent to the inlet 5 and the delivery end 31^b upturned at the delivery end near outlet 6, (Fig. 3), said track being adapted to receive and temporarily support the strip 4, as illustrated in Fig. 7. The track is shown substantially flat and horizontally disposed, having an outer wall at 31^c and an inwardly disposed edge or rib at 31^d for guiding the strip. The upper end of one leg of the wall 17 is shown terminating below the track 31 so that said leg will not interfere with lateral adjustment of strip 4.

When the apparatus is to be used chambers 1^a, 1^b are charged to a suitable height with the material or metal *a* to be used for hardening or tempering, the covers 7, 8 and 24 are closed, and heat is applied until the said material is brought to the required temperatures. For tempering thin strips of steel, such as adapted for making razor blades, the material or lead in chamber 1^a may be heated to approximately 1500° F. and the material or lead in chamber 1^b may be heated to approximately 600° F. When the material or lead is at the required temperature the latch 28 is swung back from guide 26, the latter is swung to the right in Fig. 3, and closure 24 is raised to permit access to the strip 4 through opening 6. The raising of closure 24 removes guide 11 from the tank, and the bar 10 with its roller 9 and the bar 21 are raised above the plane of track 31. A strip 4 is fed into the apparatus by pushing its free end through inlet 5 upon track 31 and working the strip along until it can be reached at the delivery outlet 6. An operator at each end of strip 4 will then pull and work the strip to lift it from the track and carry it sideways until it is presented under roller 9 and bar 21, whereupon said roller and bar are depressed to push the strip into the bath, (in position indicated in Fig. 3), a sufficient amount of the strip having been pulled out of the apparatus through opening 6. The closure 24 is then closed, whereupon its guide 11 will engage and depress the adjacent end of strip 4 which will project through member 24^a and then the guide 26 will be swung back to engage said strip and will be retained by the latch 28, the strip extending beyond guide 26, as indicated in Fig. 3. Strip 4 may be drawn through the bath and wound on a reel in any well known way as the tempering of the strip proceeds. As the strip 4 is drawn through the heated bath in chamber 1^a said strip will be raised to the desired temperature, and as it proceeds through the bath of reduced temperature in chamber 1^b the temperature of the strip will be gradually reduced so that when the strip emerges from the apparatus it will be in proper condition to be cooled in the atmosphere, whereby

the desired degree of hardness or tempering will be imparted to the strip as it travels.

By the means described we are enabled to maintain the tempering material in the tank at a substantially uniform temperature without the loss of heat which would occur if the covers 7 and 8 are required to be removed for replacing successive strips in the bath, because the strips may be inserted over the bath while the strips are cold and be depressed into the bath by the guiding means 9, 21 and 11. The cooperation of the partition 21 with the part 20 of the wall 17 serves to guide and keep the midportion of the strip in proper position respecting the spaced guides 9 and 11, so that the strip will travel substantially accurately through the bath. The wall 17 and the partition 21 serve as separating means to space the different volumes of tempering material in chambers 1^a and 1^b without undue transmission of heat from the tempering material in chamber 1^a to the tempering material in chamber 1^b. By having the wall 17 hollow a passage is provided within the hollow legs 18, 18^a and the cross passage 18^b through which cold air can be blown by any suitable means so that the temperature of the heated tempering fluid in chamber 1^a will not influence the temperature of the tempering material in chamber 1^b that is heated to a lower temperature, so that the temperature of the strip as it passes from chamber 1^a will be reduced by the temperature of the tempering material in chamber 1^b. When the partition 21 is raised for insertion of a strip in the tank the two volumes of tempering material will merge but will be again separated when the partition 21 is lowered into operative position without affecting the operativeness of the tank.

While we have shown a plurality of chambers 1^a, 1^b for the heated tempering material it will be understood that the tank may be provided with one or more chambers according to the desired character of tempering of strips, and any desired number of guides for the strip movable into and out of the tempering material may be used to depress the strip and guide it in such material.

While we have referred to the material 4 to be hardened or tempered as a strip it will be understood that such material may be of wire or have any desired shape. The tempering material may comprise lead salts or other suitable material or materials which can be brought to a fluid condition by heating.

Changes may be made in the details of construction set forth without departing from the spirit of our invention.

Having now described our invention what we claim is:

1. A tempering apparatus comprising a tank for tempering material, means to heat said tank, and guiding means in the tank for a strip, part of the guiding means dividing the tank into a plurality of chambers for said material, said apparatus being provided with openings for entrance and egress of the strip.

2. A tempering apparatus as specified in claim 1, in which the guiding means for the strip are movable in and out of the material in the tank to depress the strip into said material.

3. A tempering apparatus comprising a tank having a plurality of adjacent chambers for tempering material, means to heat said chambers to different temperatures, and means to guide a strip for passage through said chambers including means below the level of the tempering material to permit said strip to pass from one another to the other.

4. A tempering apparatus comprising a tank for tempering material, means to heat said tank, a partition movable in and out of the tank, means to guide the partition, space being provided below the partition for the passage of a strip, the apparatus having an inlet and an outlet for the strip, and guiding means for the strip on opposite sides of the partition.

5. A tempering apparatus as specified in claim 5, in which the guiding means for the strip are movable in and out of the material in the tank to depress the strip into said material.

6. A tempering apparatus comprising a tank provided with spaced interior walls, a partition guided between said walls to move into and out of the tank, said apparatus having an inlet and an outlet for a strip, means to heat the tank, and guiding means for the strip on opposite sides of the partition, a guiding space being provided below the partition for the strip.

7. A tempering apparatus comprising a tank provided with spaced guiding means for a strip, means to support said guiding means for movement into and from the tank, said apparatus having an inlet and an outlet for the strip, means to heat the tank, and a track for the strip extending along the tank at one side of said guiding means.

8. An apparatus as specified in claim 7, in which the track for the strip is provided with a wall on the side opposite the guiding means, an unobstructed space being provided on the side of the track toward the guiding means to permit the strip to be passed from the track under the guiding means.

9. A tempering apparatus comprising a tank having an interior hollow wall provided with an inner space having guiding means, a partition slidable in said guiding means, said wall having a portion opposing

the inner end of the partition, a space being provided between said inner wall and the adjacent end of the partition for guiding a strip, guiding means in the tank on opposite sides of said wall and partition, the apparatus having an inlet and an outlet for said strip, and means to heat the tank.

10. A tempering apparatus comprising a tank having an interior hollow wall provided with an inner space having guiding means, a partition slidable in said guiding means, said wall having a portion opposing the inner end of the partition, a space being provided between said inner wall and the adjacent end of the partition for guiding a strip, guiding means in the tank on opposite sides of said wall and partition, the apparatus having an inlet and an outlet for said strip, means to heat the tank, and a track for the strip extending along the tank at one side of said partition and guiding means above the material in the tank, said wall on one side terminating below the track, the guiding means being movable into and from the tank to receive a strip therebeneath from the track.

11. A tempering apparatus comprising a tank, covering means for the tank, the apparatus having an inlet and an outlet for a strip, a guide for the strip near the inlet, means movably supporting the guide for passage into and from the tank, a movable closure for the outlet, a movable guide for the strip adjacent to the outlet, and a guide for the strip beyond the outlet.

12. A tempering apparatus comprising a tank, the apparatus having an inlet and an outlet for a strip, a guide for the strip near the inlet, means movably supporting the guide for passage into and from the tank, a movable closure for the outlet, a guide for the strip carried by said closure, and a guide for the strip beyond the outlet.

13. A tempering apparatus as specified in claim 11, in which the movable closure is provided with a funnel-like member for the passage of said strip.

14. A tempering apparatus comprising a tank, a casing and covering means enclosing the tank, means to heat the tank, the apparatus having an inlet and an outlet for a strip, the closing means having tubes, a bar movable in one of the tubes and provided with guiding means for the strip, means to movably support the bar in said tube, a wall in the tank having guiding means, a partition slidable in said guiding means, the closing means having a tube for the partition, a closure for the outlet having an opening for the strip, and means to guide the strip through said opening.

15. An apparatus as specified in claim 14 having a track at one side of the strip guides terminating near said inlet and outlet.

16. A tempering apparatus comprising a tank adapted to contain tempering material, means within the tank to divide said material into separate portions, said means having its upper portion closed, means to heat one portion of the material to one temperature and another portion to a different temperature, and means below the level of the tempering material to permit a strip to pass through the dividing means from one portion of the material to another portion.

17. A tempering apparatus as specified in claim 16 in which the dividing means has an opening below the surface of the tempering material to permit the strip to pass from the material having the higher temperature to the material having the lower temperature, said opening permitting the two portions of said material to join below the surface of the material in the absence of a strip.

18. A tempering apparatus comprising a tank, a wall within the tank dividing the same into a plurality of chambers for tempering material, said wall being provided with a passageway for air whereby the temperature of the tempering material in one chamber will not influence the temperature of the tempering material in the adjacent chamber, means to permit the strip to pass from one chamber to the other through said wall, and means to heat the tempering material in said chambers to different degrees of temperature.

19. A tempering apparatus comprising a tank for tempering materials provided with a plurality of chambers closed against communication at their upper portions and having means below the level of the tempering material providing communication between said chambers, means to heat the tempering material in said chambers to different degrees of temperature, means to guide a strip into the chamber having the material of higher temperature, and means to guide the strip out of the chamber having tempering material of lower temperature, said strip being adapted to pass from one chamber to the other below the level of the tempering material through said communicating means.

Signed at New York city, county and State of New York, this 23rd day of June, 1923.

HENRY J. GAISMAN.
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