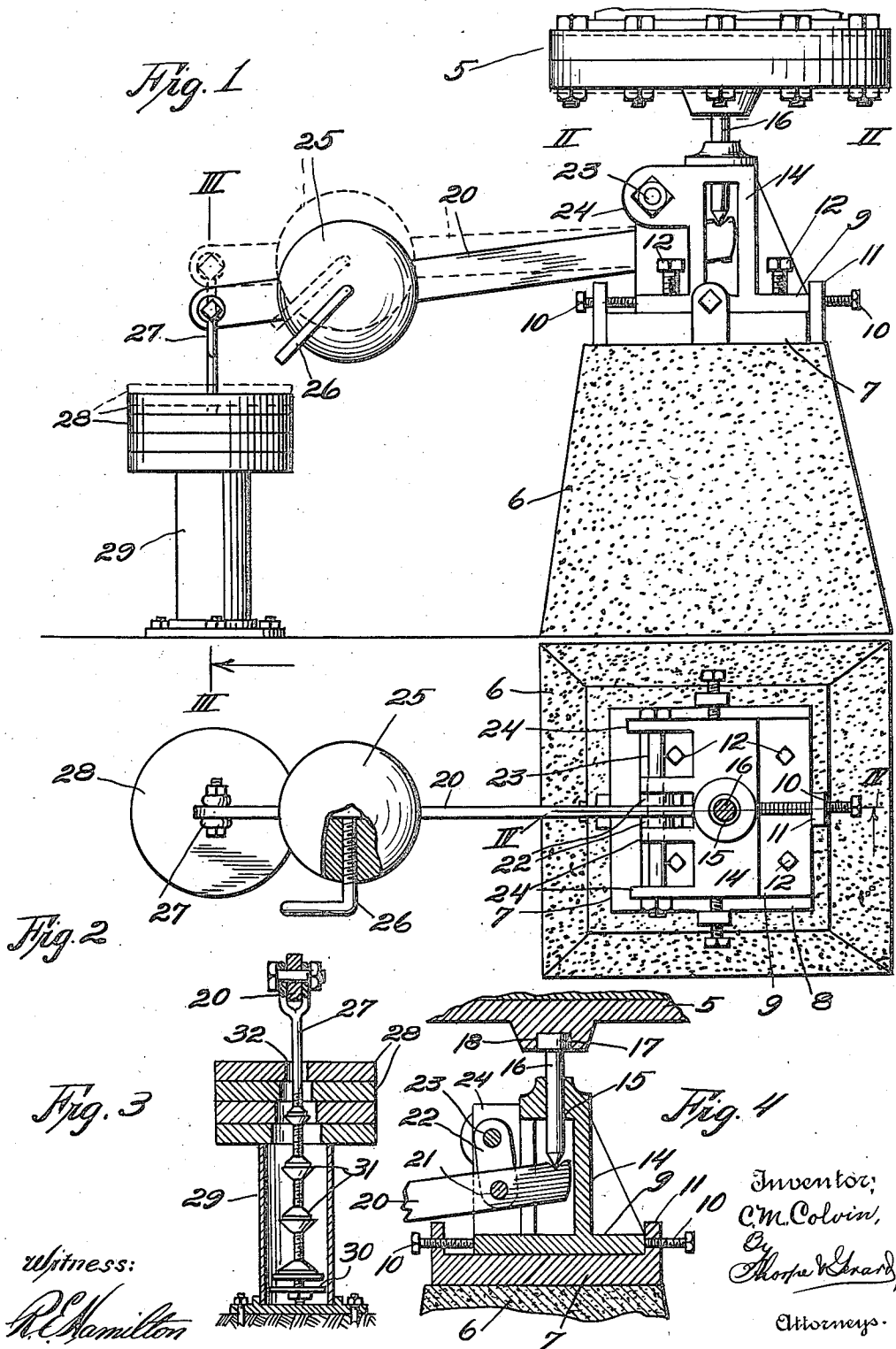


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 COMPENSATING DEVICE FOR REACTION TUBES.  
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Witness:  
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## UNITED STATES PATENT OFFICE.

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## COMPENSATING DEVICE FOR REACTION TUBES.

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*To all whom it may concern:*

Be it known that I, CADET M. COLVIN, a citizen of the United States, and resident of Kansas City, county of Jackson, State of Missouri, have invented a certain new and useful Improvement in Compensating Devices for Reaction Tubes, of which the following is a complete specification.

The present invention relates to apparatus designed for use in refining processes, and aims to provide a novel form of supporting structure for use in connection with the reaction tubes employed as a part of certain electrochemical apparatus adapted for the manufacture of hydrocarbons from crude oil or its distillates, with a view to applying the necessary auxiliary supporting pressure upon such tubes for compensating for any changes in the linear dimensions of the tubes due to the temperature changes therein in the carrying out of the process.

Accordingly, one of the principal objects of the invention is to provide a movable supporting device adapted to be maintained in operative relation to the reaction tube and acting automatically to effect the required variable pressure upon the tube to compensate for either increases or decreases in the length of the tube as the latter is affected by the heat generated in the reaction characterizing the carrying out of the process.

With this general object in view, as well as minor objects as will appear in the course of the detailed description, the invention will now be described by reference to the accompanying drawing illustrating one form of construction which I have devised for the practical embodiment of the same, after which the novel features therein will be specifically set forth and claimed.

In the drawing—

Figure 1 is a side elevation, illustrating the lower end of a reaction tube having associated therewith a supporting structure arranged in accordance with the present invention;

Figure 2 is a sectional plan view, representing a section taken on the line II—II of Figure 1;

Figure 3 is a detail section, taken on the line III—III of Figure 1; and

Figure 4 is a detail section, taken on the line IV—IV of Figure 2.

Referring now to the drawing in detail, this illustrates the base portion of a reaction tube such as is employed in the practice of a certain refining method or process of the character set forth generally in Patent No. 1,229,886, dated June 12, 1917, certain forms of apparatus for the practice of which process are also illustrated in Patents Nos. 1,327,023 and 1,345,431, dated January 6 and July 6, 1920, respectively. In the course of the reaction carried on in these tubes a comparatively high degree of heat is attained, on account of which the tubes are necessarily affected and show appreciable changes in length, by expansion and contraction, in response to the temperature changes produced within the tubes at the different stages of the process. In practice, these tubes have been supported in substantially vertical position, and where they are supported from above in entirely suspended relation it has been found that after an expansion under the maximum temperature reached during the process there is difficulty experienced in the return of the tubes to their normal original condition on account of the sagging of the metal under the tensile strain caused by the weight of the metal in this suspended form and while in this highly heated condition. On the other hand, it is found if the tubes are supported both above and below, they will buckle under the stress which is opposed to the normal expanding tendency of the metal, with resultant injury to the tubes and causing of the same to lose their proper contour and become out of line. Substantially the same result takes place where the tubes are supported entirely from below, since on becoming highly heated the tubes will buckle under the weight of the metal forming the tubes.

For overcoming these difficulties, I have devised a supporting structure which will apply the necessary supporting pressure against the lower end of the tube for compensating for the usual length changes taking place therein in response to the temperature changes effected by the process, assuming that the main supporting action is applied to the tube from above, and that the

function performed by my auxiliary supporting means is simply that necessary for opposing the expanding action of the tubes and preventing such expansion from exceeding that normally attending the temperature change in the metal and thereby preventing any abnormal expansion or sagging such as would be produced by the weight of the metal if this were not supported by the means herein described.

Beneath the lower end of each of the reaction tubes 5, and in alinement therewith, I provide a suitable foundation 6 on which is mounted a base plate member 7 slidingly and adjustably accommodating a bracket block 9, the position of which, relative to the plate 7, is controlled and set by means of a pair of adjusting screws 10 operating in lugs 11 at opposite side of the plate 7. The block 9 is further adjusted in order to assure true horizontal position thereof by means of a set of adjusting screws 12 threaded substantially vertically through the block 9 into engagement with top surface of the plate 8.

The block 9 is formed with an upright frame portion 14, in the upper end of which is formed a suitable bore 15 for accommodating a supporting pin 16 having a head portion 17 which is seated comparatively loosely within a recess 18 formed in the under face of the bottom plate of the tube 5, as shown in Figure 4. The lower end of the pin 16 is provided with a knife edge type of support upon one end of a lever 20, this lever having a swinging fulcrum support comprising a fulcrum pin 21 carried by a pair of swinging links 22 suspended from a pin 23 mounted in lugs 24 projecting out from the upper end of the frame 14. The lever 20 is thus fulcrumed near that end which engages the post or pin 16, so that a relatively small movement of this end of the lever will be accompanied by a much greater movement of the outer or counterweighted end of the lever, whereby the requisite force or compensating pressure may be exerted upon the lower end of the tube 5 by the weights to be applied to the outer or free end of said lever 20.

The outer end portion of the lever 20 has mounted thereon a counterweight member 25 adapted to be shifted into different positions upon the lever and clamped in any desired position by means of a clamping screw 26 (see Figure 2). This weight 25 is for the purpose of applying a substantially constant force against the lower end of the tube 5, such as has been found desirable for steadying the lower end of the tube and sufficient to counteract any slight expansive tendency on the part of the metal forming the tube, or until a considerable increase in the heat of the reaction has taken place. At the extreme outer end of the lever 20 is pivotally attached a depending link 27 which is

threaded through a set of weights 28 supported upon a hollow cylinder 29 in superposed relation. The lower end of the link 27 is provided with a plate 30 of slightly less diameter than the cylinder 29 for maintaining the link 27 alined substantially centrally within the cylinder 29. Above the plate 20 the link 27 is provided with suitably spaced weight-engaging blocks or knobs 31 adjustably secured to the link, and adapted for successive engagement with the weight 28, for which purpose the latter are provided with central openings 32 gradually diminishing in size from the lowermost weight 28 to the uppermost of said weights as clearly illustrated in Figure 3. By means of this construction, it is obvious that as the lever 20 rocks about its fulcrum pin 21 in response to an increase in the length of the tube 5, its outer end will rise and lift the link 27, and eventually will cause the uppermost knob 31 to engage the top weight 28, thereby adding the weight of the latter to the outer end of the lever 20. Further expansion and consequent lengthening of the tube 5 will produce a continued upward movement of the outer end of the lever 20 and hence cause the second knob 31 to engage the second weight 28, thus adding to its load to the outer end of the lever 20, and so on through the series. As the tube 5 contracts, due to a reduction of the heat of the reaction therein, the reverse of the foregoing operation will take place, the weights 28 being successively released as the outer end of the lever 20 lowers, due to the diminishing of the pressure applied to the inner end of the lever by the pin 16.

It will thus be apparent that I have devised a simple and practical construction for effecting the desired objects of the invention, the operation of which is entirely automatic in insuring that the tube 5 will, in the expansion thereof under the high heat of the reaction, be prevented from undue sagging under the weight of the load of metal forming the tube; and further, insuring also the return of the tube to its original normal condition by the supplementary supporting action of the improved device, the return to which condition could not be produced solely by the tensile strength of the metal forming the tube.

While I have shown and described what I now regard as the preferred form of construction for embodying the invention, I desire to reserve the right to make such changes as may fairly fall within the scope of the appended claims.

What I claim is:

1. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, and means associated with said member for caus-

ing it to exert a compensating supporting pressure upon the tube tending to oppose an increase in the length of the latter.

2. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, and adjustable means associated with said member and operative to apply a continuous supporting pressure upon the tube in opposition to any lengthening tendency therein.

3. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, and means associated with said member and operative to apply a variable supporting pressure upon the tube responsive to changes in the length thereof.

4. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, and self-adjusting means associated with said member and operative to apply a progressively increasing supporting pressure upon the tube in response to increments in the length thereof.

5. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, and self-adjusting means associated with said member and operative to apply a progressively decreasing supporting pressure upon the tube in response to successive decrements in the length thereof.

6. A supporting structure comprising, in combination with a reaction tube, a vertically movable supporting member adapted to maintain engagement with the lower end of said tube, a lever operatively engaged at one of its ends with said member, and a weight adjustably mounted upon the other end of said lever.

7. A supporting structure comprising, in combination with a reaction tube, a vertically movable supporting member adapted to maintain engagement with the lower end of said tube, a lever operatively engaged at one of its ends with said member, a swinging fulcrum support for said lever, and a weight carried by the other end of said lever.

8. A supporting structure comprising, in combination with a reaction tube, a vertically movable supporting member adapted to maintain engagement with the lower end of said tube, a lever operatively engaged at one of its ends with said member, and a set of weights adapted to be successively picked up or released by the other end of said lever as the latter is rocked in response to variations in the length of said tube.

9. A supporting structure comprising, in combination with a reaction tube, a verti-

cally movable supporting member adapted to maintain engagement with the lower end of said tube, a lever operatively engaged at one of its ends with said member, a set of weights adapted to be successively picked up or released by the other end of said lever as the latter is rocked in response to variations in the length of said tube, and means for varying the intervals at which said weights are picked up or released by said lever.

10. A supporting structure comprising, in combination with a reaction tube, a vertically movable supporting member adapted to maintain engagement with the lower end of said tube, a lever operatively engaged at one of its ends with said member, a link carried by the other end of said lever and provided with a series of weight-engaging elements, and a set of weights adapted to be successively picked up or released by said engaging elements as said lever is rocked in response to variations in the length of said tube.

11. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, means associated with said member and operative to apply a variable supporting pressure upon the tube responsive to changes in the length thereof, and adjustable means operative to align said supporting member axially with said tube.

12. A supporting structure comprising, in combination with a reaction tube, a movable supporting member adapted to maintain engagement with one end of said tube, means associated with said member and operative to apply a variable supporting pressure upon the tube responsive to changes in the length thereof, and sets of adjusting means operating at right angles to each other for aligning said supporting member axially with said tube.

13. A supporting structure comprising, in combination with a reaction tube, a guide bearing frame mounted beneath the lower end of said tube, a vertically movable supporting pin operating in said bearing and adapted to maintain engagement with said lower end of said tube, and horizontally acting adjusting means operative to shift said bearing frame to effect alinement of said pin axially with said tube.

14. A supporting structure comprising, in combination with a reaction tube, a guide bearing frame mounted beneath the lower end of said tube, a vertically movable supporting pin operating in said bearing and adapted to maintain engagement with said lower end of said tube, and vertically acting adjusting means operative to shift said bearing frame to effect alinement of said pin axially with said tube.

15. A supporting structure comprising, in combination with a reaction tube, a guide bearing frame mounted beneath the lower end of said tube, a vertically movable supporting pin operating in said bearing and adapted to maintain engagement with said lower end of said tube, and combined vertically and horizontally acting adjusting means operative to shift said bearing frames to effect alinement of said pin axially with said tube.

In witness whereof I hereunto affix my signature.

CADET MANLEY COLVIN.