S. W. PARR.

CALORIMETRIC APPARATUS.

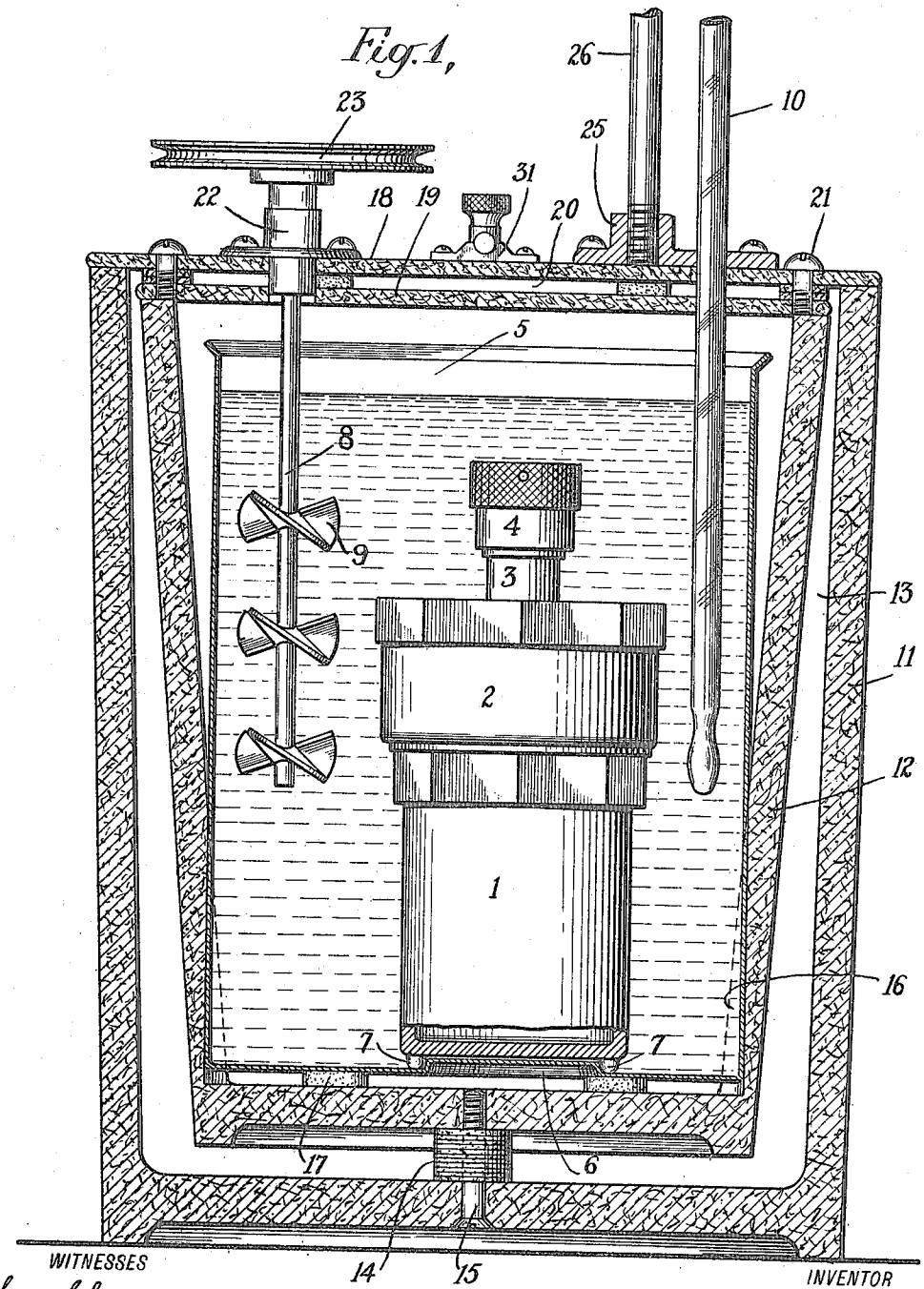
APPLICATION FILED FEB. 27, 1914.

1,136,359.

Patented Apr. 20, 1915.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2

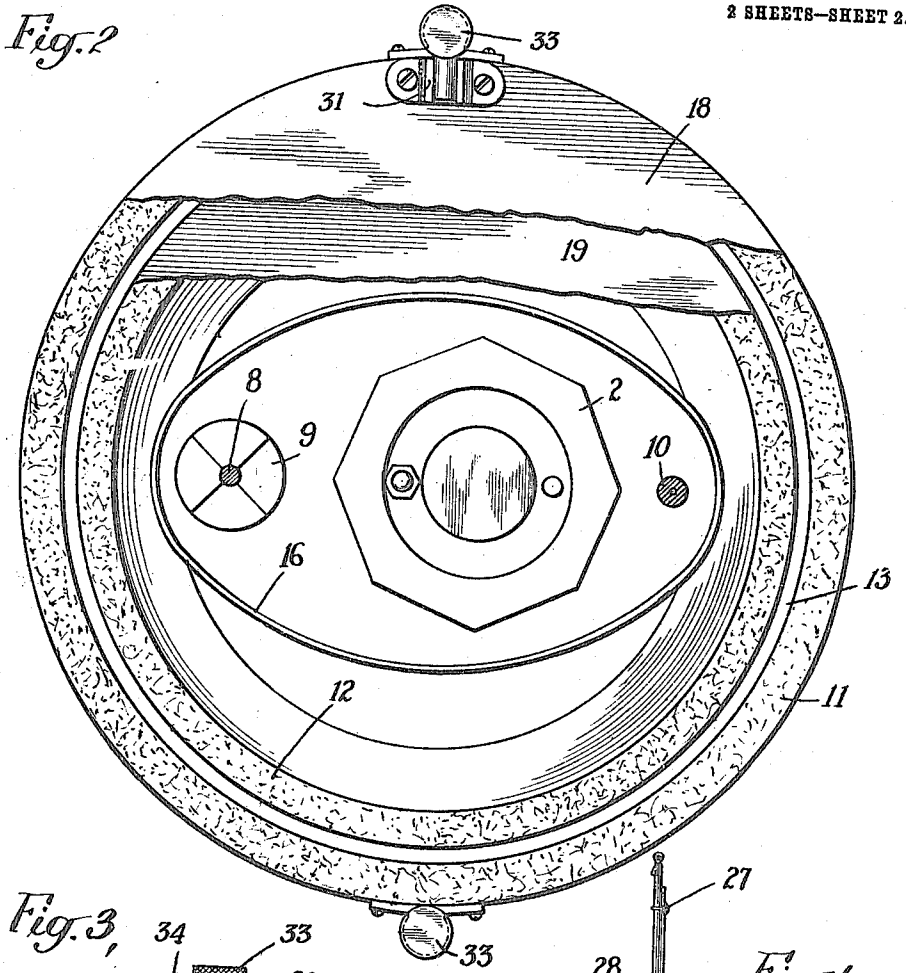


Fig. 3,

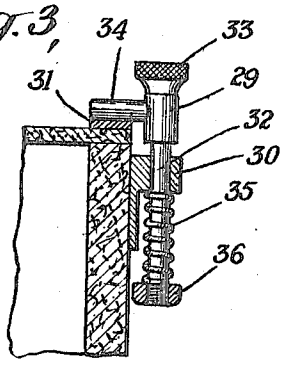
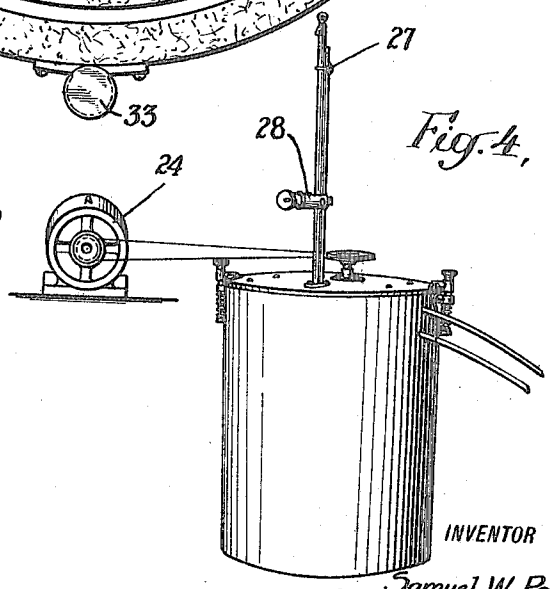


Fig. 4,



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UNITED STATES PATENT OFFICE.

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CALORIMETRIC APPARATUS.

1,136,359. Specification of Letters Patent. Patented Apr. 20, 1915.

Application filed February 27, 1914. Serial No. 821,592.

To all whom it may concern:

Be it known that I, SAMUEL W. PARR, a citizen of the United States, residing at Urbana, county of Champaign, and State of Illinois, have invented certain new and useful Improvements in Calorimetric Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In calorimetric measurements the heat generated by the combustion of fuel in the bomb or combustion chamber effects a rise in temperature of the surrounding liquid, for instance, water, and the rise in temperature of the water (suitable corrections having been made for loss of heat by radiation and the like), indicates the calorific value of the material under test. For accurate measurements the heat absorption from the bomb must be effected quickly, otherwise the radiation losses and other variables will introduce inaccuracies, and the rise in temperature of the surrounding water must be uniform throughout the body of water or the theremometer reading may be misleading. Heretofore, it has been customary to arrange a flat stirring plate around the bomb and between it and the walls of the water container, and to move this up and down, so that the water will be agitated during the heat transfer. This arrangement is not satisfactory because there is no uniform circulation of the water, but merely an irregular agitation, and there are "dead" spaces where the agitation is very indifferent or totally lacking. From a mechanical standpoint, up and down movements of the stirring plate or rings of sheet metal are not easily effected, and it is not easy to adjust the apparatus so that the stirrer will move smoothly and without hitting the sides of the water container or the bomb.

It is an object of the present invention to provide a water container of oval outline so proportioned that there is room for a turbine stirrer at the side of the bomb, and the bomb is so positioned in the oval container that free circulation passages are provided on all sides and a positive and quick circulation in every part can be accomplished.

In accordance with the present invention, the cooling liquid is pumped in positive manner by a rotary screw or turbine and passes upward through one of the free channels at the side of the bomb, and then flows across and downward through the other free channel, sweeping across the top and side of the bomb and effecting quick absorption of its heat and uniform rise in temperature of the entire body of cooling liquid and the entire mass of the water container. The compact form of the apparatus keeps down the radiation loss and the quickness and high efficiency of heat transference eliminates many of the variables heretofore found troublesome in calorimetric work.

Other objects and advantages of the present invention will be made clear by the following detailed description, which is to be taken in conjunction with the accompanying drawings, wherein—

Figure 1 is a sectional elevation of the complete apparatus with a bomb immersed in the cooling liquid; Fig. 2 is a plan view partly in section showing the oval outline of the water container and the relative positions of the turbine, the pump, and the thermometer; Fig. 3 is a detail of the spring catch used to hold the covers of the insulating buckets; Fig. 4 is a perspective view of the complete apparatus while in use.

In the embodiment illustrated by the drawings, the bomb or combustion chamber 1 may be of usual type with a removable cover 2, a neck 3, equipped with a cover, and retaining collar 4 as shown, though the details of the bomb may vary and combustion chambers of very different size and pattern may be used.

Surrounding the bomb is a body of water or other cooling liquid held in a thin metal container 5 of oval outline, as shown in Fig. 2. This may be of brass, and preferably has in its bottom a small, round platform 6 formed by pressing the metal upward, this platform serving as a guide for the bottom of the bomb, and by coöperation with three lugs 7 on the bottom of the bomb holding the latter in a definite position with respect to the stirrer and the thermometer.

The stirrer preferably consists of a vertical shaft 8 carrying a plurality of turbine blades 9 positioned relatively to the bomb in about the relation indicated by Figs. 1 and 2, so that when the stirrer is rotated, a positive upward circulation of water will be established in the free water channel between the oval end of the water container 5 and the bomb, and water lifted upward through this passage will flow across over the top of the

bomb and down at the other side where the thermometer 10 is located, and then will sweep across the sides of the bomb on its way back to the turbine. There are no "dead" spaces and all of the water is kept in motion and the circulation is positive and uniform, the heat absorbing relation of the water to the calorimeter being accurately reproduced for successive tests, thereby making it possible to accurately calibrate the apparatus as a whole, and to accurately correct for radiation losses and the absorption of heat from the water by the metal container 5.

As a means for controlling the heat radiation from the apparatus there is provided an outer bucket 11, preferably of indurated fiber, and an inner bucket 12, also of indurated fiber, fitting therein, with a dead air space 13 between the two buckets. The inner bucket may be held in fixed position by a spacing block 14 and a screw or bolt 15, for when once assembled the inner bucket need not ordinarily be removed from the outer bucket. The walls of the inner bucket are made relatively thick and flaring, and near the base of the bucket are cut away at 16 to form sockets for the reception of the lower end of metal container 5. By this means an accurate alinement of all the other parts may be effected and proper operative relation between the stirrer, the bomb, and the thermometer is insured. Supporting blocks 17 of poor thermal conductivity may be used to space container 5 above the bottom of the inner bucket 12.

As a cover for the buckets I prefer to provide indurated fiber plates 18 and 19 spaced apart by washers to form an air space 20, and clamped together by bolts 21. Openings through these plates admit the bearing 22 of the turbine stirrer, and above this bearing is a pulley 23 connected with shaft 8 and driven in suitable manner as from a motor 24 (see Fig. 4) driven at constant or controllable speed. The cover plates also carry a fitting 25 serving as a support for a standard 26 to which the thermometer 10 is held by clamp 27 (see Fig. 4), and on which a reading lense 28 may be adjusted to read the thermometer. The thermometer passes down through a hole in fitting 25 into position in the water passage between the oval end of container 5 and the bomb.

As a means for conveniently locking the cover in place on the buckets and for assuring accurate positioning of the stirrer and thermometer with respect to the buckets and, consequently, with respect to the water container 5 and the bomb, there is provided a pair of spring fastenings 29 (see Figs. 2 and 3). Each of these fasteners comprises a bracket 30 secured to the side of the outer bucket and a notched plate 31 secured to cover plate 18. Passing through bracket 30 is a vertical post 32 carrying at its top a knurled thumb piece 33, to which is attached a horizontally projecting arm 34 which can be swung into and out of engagement with notched plate 31 to secure or release the cover. A coiled spring 35 encircles the vertical post 32 and is held in position against bracket 30 by a retaining nut 36, so that there is a downward pull on arm 34 yieldingly holding the covers against their buckets, but by forcibly turning the thumb piece 31, the springs will yield sufficiently to allow arms 34 to swing out of their notches, thereby releasing the cover and permitting ready removal of the stirrer and thermometer, and of the calorimeter.

Assembly of the parts can be effected very quickly and the parts can be removed and replaced repeatedly with the certainty of reproducing within the water container the same relative relations of stirrer, bomb and thermometer, and the same operative conditions for positively circulating the water at definite and controllable speed, and on all sides of the bomb.

I claim:

1. Calorimetric apparatus comprising a water container of oval cross-section, a cylindrical combustion chamber in said container with relatively large water channels on diametrically opposite sides thereof, a stirrer in one of said water channels open to free circulation of water on all sides and a thermometer in the other channel, and means for rotating said stirrer to produce positive circulation of the water around the lower part of said combustion chamber and upward through one of said water channels and downward through the other, to quickly cool the lower part of said combustion chamber and to uniformly distribute the absorbed heat through the cooling water.

2. Calorimetric apparatus comprising a liquid container of oval cross section, a turbine stirrer at one end of the oval, and a combustion chamber widest at the top and positioned to be swept by the flow of liquid maintained by said turbine stirrer the end of said stirrer being lower than the widest part of said combustion chamber.

3. In calorimetric apparatus, a water container of oval cross section, a combustion chamber therein having an upper portion wider than its lower portion, means for holding said combustion chamber in proper relative position to the walls of said container, a turbine stirrer at one end of the oval for positively circulating water up one side of the combustion chamber and down the other, said stirrer projecting below the widest part of said combustion chamber, and a thermometer positioned to measure the temperature of said circulating water.

4. In a calorimetric apparatus, a water container of oval cross section, a combustion chamber positioned therein, means for circu-

lating water in said oval chamber around the bottom of said combustion chamber and upward along one side thereof and downward along the other side, said combustion chamber being of greatest diameter near its top and positioned to form a baffle directly in the path of the circulating water for the more ready and uniform absorption of its heat by the water while thus in circulation.

5. A water container for calorimeters, said container being of oval cross-section and having its bottom bent to secure registration between the container and the combustion chamber introduced therein.

6. Calorimetric apparatus comprising in combination a fiber bucket, a water container of oval cross section fitted therein, said bucket having recesses for receiving the oval ends of the container and maintaining proper alinement in the bucket, a cover for said bucket, and a turbine stirrer and a thermometer carried by said cover and adapted to project into the water of said water container, and means for adjusting the cover with respect to the bucket so that the stirrer and thermometer may be maintained in proper operative relation to said oval container.

7. In a calorimetric apparatus, the combination of a fiber bucket, a second bucket fitted therein with an air space between, said second bucket being cut away on the inside to form a pair of sockets, a water container of oval cross section positioned within said inner bucket and fitting in said recess, a cover for said buckets, a turbine stirrer and a thermometer carrier by said cover, and means for adjusting the cover on the buckets to insure proper positioning of the turbine and the thermometer at the oval ends of the water container.

8. A calorimetric apparatus comprising in combination a fiber bucket, a water container therein, a combustion chamber within said water container, a cover for said bucket, a stirrer supported by said cover, and a spring catch detachably connecting said cover to said bucket, and when in secured position insuring proper registration of said stirrer with respect to said water container and the combustion chamber.

9. In a calorimetric apparatus, the combination of an insulating bucket, a cover therefor, a water chamber within said bucket, a stirrer carried by said cover, and a spring catch for securing said cover to said bucket, said catch comprising a spring pressed post slidingly mounted on the bucket and having an arm swinging into and out of effective locking engagement with said cover.

In testimony whereof I affix my signature, in presence of two witnesses.

SAMUEL W. PARR.

Witnesses:
T. W. BECK,
T. H. BARTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Correction in Letters Patent No. 1,136,359.

It is hereby certified that in Letters Patent No. 1,136,359, granted April 20, 1915, upon the application of Samuel W. Parr, of Urbana, Illinois, for an improvement in "Calorimetric Apparatus," an error appears in the printed specification requiring correction as follows: Page 3, line 37, for the word "carrier" read *carried;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of May, A. D., 1915.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.