J. J. MOJONNIER.

CENTRIFUGE.

APPLICATION FILED MAY 20, 1916.

1,334,109. Patented Mar. 16, 1920.

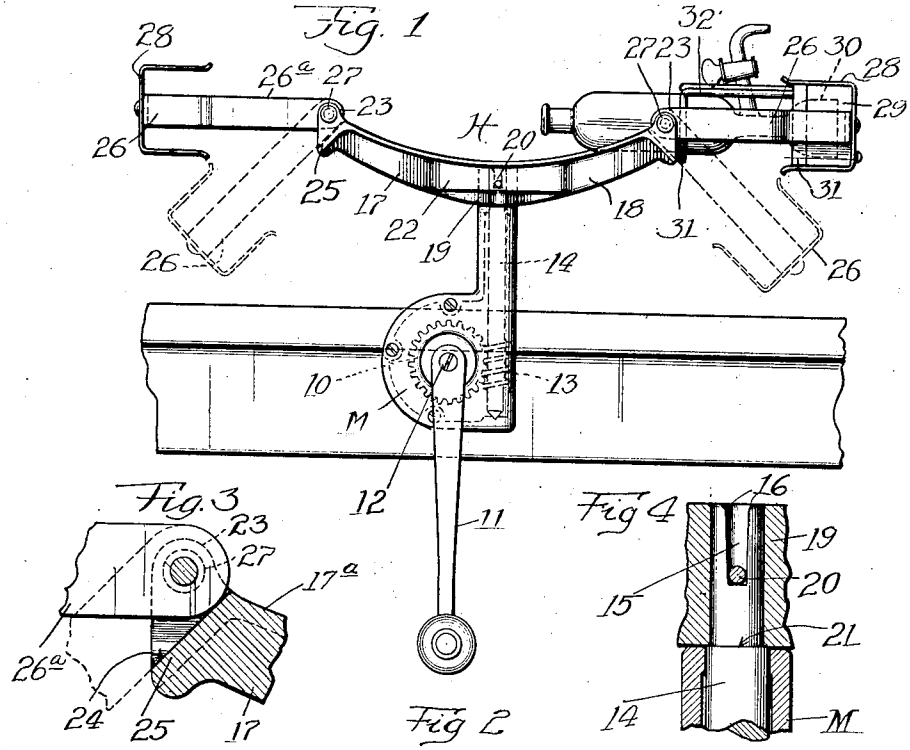
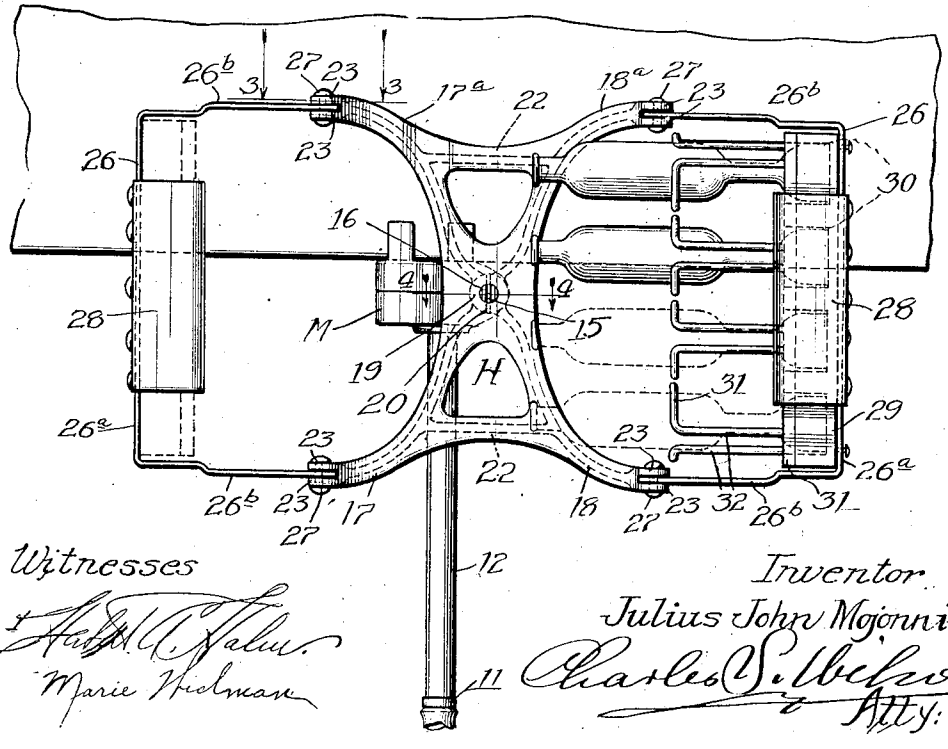


Fig 2



Witnesses

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UNITED STATES PATENT OFFICE.

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CENTRIFUGE.

1,334,109. Specification of Letters Patent. Patented Mar. 16, 1920.

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To all whom it may concern:

Be it known that I, JULIUS JOHN MOJONNIER, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Centrifuges, of which the following is a specification.

In chemical analysis, tests, extractions, and in the industrial and applied arts and sciences it often becomes necessary to submit containers or flasks inclosing mixtures of liquids and other ingredients to a rapid rotary movement or in other words to centrifugal force, in order to sharply separate suspended solid particles from the liquid, or to similarly separate and define two immiscible liquids, usually of a different density, one from the other.

The present invention is designed to provide an improved apparatus whereby such rotary movement or centrifugal force may be applied to any desired degree, to a number of flasks or containers.

With the above and other objects in view, as will be apparent, this invention consists in the construction, combination and arrangement of parts all as hereinafter more fully described, claimed and illustrated in the accompanying drawings wherein:—

Figure 1 is an elevation of a centrifuge constructed in accordance with the present invention, and illustrates in dotted lines the passive positions of the carrying yokes and in full lines the active or operative positions of the same;

Fig. 2 is a top plan thereof illustrating the same in conjunction with a plurality of flasks or containers and with carrying yokes in their active or operative positions;

Fig. 3 is a fragmentary vertical section taken along line 3—3 of Fig. 2 to illustrate the means for limiting the downward movement of the carrying yokes;

Fig. 4 is a similar section taken along line 4—4 of Fig. 2 and discloses the mounting and securing of the centrifuge head to the drive shaft therefor.

In commercial tests or extractions, such as that contemplated in the copending application, Serial No. 20,633 or in fact any test, the efficiency and utility thereof depends greatly upon the facility and speed with which the same may be accurately carried out and completed. Where many tests or extractions are made it is highly desirable, for the best efficiency and results, that as many steps or portions of the tests or extractions as possible may be performed simultaneously. As a consequence thereof the present invention is designed to provide a means whereby many flasks, test tubes, or containers with their contents may be shaken and centrifuged simultaneously, as distinguished from the apparatus heretofore in use, where the number of flasks, test tubes or containers capable of being carried thereby is extremely limited. Furthermore, the present apparatus is designed to accommodate many varieties and styles of flasks, test tubes or containers, as against the restricted capacity of the devices of the art prior hereto.

In carrying out the present invention, a suitable source of power is provided and constitutes the motor M, which, while it may be of a size, type or character, is here illustrated and described, for the purposes of convenience, as being manually operable. Such a motor M comprises the gear 10 keyed to the power shaft 12, the latter being rotated by the crank or handle 11 at the outer end thereof. This gear 10 meshes with a worm 13 at the lower end of the vertical drive shaft 14, which projects at its upper end beyond the casing of the motor M. Hence, as the power shaft 12 is rotated by its source of power, so will the drive shaft 14 be rotated in proportion to the speed of rotation of said power shaft.

Mounted upon the projecting end of the drive shaft 14 is the centrifuge head H which comprises a central bearing 19 for encircling said drive shaft, with the pairs of arms 17, 17ª, and 18, 18ª extending therefrom in such a manner that the bearing 19 forms the approximate center of said centrifuge head. This bearing 19 is traversed by a medial pin 20, adapted to enter the oblique slot 15 bifurcating the projecting end of the shaft 14 at an angle to the vertical plane: thereby removably securing the head H to the drive shaft 14. To expedite the insertion of the pin 20 in the slot 15, the walls of the latter terminate in the opposed bevels 16, which co-act to guide said pin into the slot. The provision of the slot 15 at an angle to the vertical plane presents an impedance to accidental removal of the pin 20 from the slot, and this has been found to be sufficient to normally maintain the head H in its op-

erative position upon the shaft 14, where it coöperates, if desired, with supporting shoulder 21.

The formation of the head H is such that the individual arms of each pair of arms 17, 17ª or 18, 18ª form continuations one of the other, said arms of each pair being curved to converge toward the bearing 19 where they merge with each other and with said bearing. Hence the head H partakes somewhat of the nature of a spider-frame, having the arms 17, 17ª apposed to arms 18 and 18ª respectively, whereby the arm 17 is longitudinally alined with the arm 18 and the arm 17ª is longitudinally alined with the arm 18ª. In order to insure a complete clearance of the carrying yokes (to be hereinafter more fully described) the head H is curved upwardly at its ends thus positioning the terminals of the arms 17, 17ª and 18, 18ª above the plane of the bearing 19.

At their terminals the arms 17, 17ª, 18 and 18ª rest in approximately the same horizontal plane and at the same time are alined one with the other. That is to say the terminal of the arm 17 is alined, transversely of the head H, with the terminal of the arm 17ª and, longitudinally of said head, with the terminal of the arm 18: the terminal of the arm 17ª in addition to being alined with the terminal of the arm 17 is also alined longitudinally of the head H with the terminal of the arm 18ª: and the terminals of the arms 18, 18ª are alined with each other transversely of the said head. Hence two pairs of carrying arms are created viz:—the arms 17, 17ª and the arms 18 and 18ª. As the arms 17 and 18, and the arms 17ª and 18ª extend, respectively, in opposite directions, due to the curvature thereof from the central bearing 19, it is desirable to brace these arms and for the purpose a bracing web 22 is interposed between the arms 17 and 18, and also between the arms 17ª and 18ª.

The terminals of the arms 17, 17ª, 18 and 18ª are each bifurcated to form the branches 23, which at their inner ends terminate in the oblique surface 24 forming the inner end of the bifurcation. At its inner end the oblique surface 24 is continued by an extension 25 which increases the area of said surface and thereby increases its efficiency in carrying out its function, to be hereinafter elaborated upon. These bifurcations provide means for pivoting the carrying yokes 26 to the arms 17, 17ª and 18, 18ª, one yoke 26 being pivoted to each pair of arms. Each carrying yoke 26 comprises a single section of material bent to form the base 26ª and the arms 26ᵇ (Fig. 2); the latter at their terminals being pivoted between the coöperating branches 23 of the arms 17, 17ª and 18, 18ª, by means of the bolt, rivet, pin or other suitable means 27. Manifestly each pair of arms 17, 17ª and 18, 18ª has a carrying yoke 26 pivoted thereto in such a manner that it is free to swing about its pivots.

When the centrifuge head H is stationary the arms 26ᵇ of the yokes 26 rest upon the oblique surfaces 24 and their extensions 25, thus supporting the yoke 26 in the dotted line positions in Fig. 1, which are the passive or inactive positions thereof. As the shaft 14 is rotated in the manner heretofore described the yokes 26 swing from the dotted to the full line positions due to the centrifugal force of the rotation of the said shaft 14 and head H.

In order that flasks, test tubes, containers and the like may be carried by the yokes 26, the base 26ª of each yoke has a U-plate 28 secured thereto midway of the arms 26ᵇ of said yoke. The arms of each of these U plates 28 are approximately parallel one to the other and extend toward the ends of the arms 26ᵇ of the yoke 26, so that holders in which flasks or test tubes are placed will be located between said arms 26ᵇ, and the flasks or test tubes held thereby will extend toward the head H. Inasmuch as the holders (to be described) containing the flasks or test tubes are placed in the U-plates 28 and between the parallel arms thereof, it becomes apparent that the centrifugal force which swings the yokes 26 to horizontal positions will likewise so position the holders and also the flasks or test tubes held thereby. Naturally a centrifugal force thus applied will sharply separate suspended solid particles from the liquids within the flasks or test tubes, or in the case of immiscible liquids will similarly separate them.

The holder for the flasks or test tubes F which coöperates with each yoke 26 comprises an elongated base or block 29, of a length substantially equal to the length of the base 26ª of the yoke 26, upon which it rests between the arms of the U plate 28 which retains the block 29 in place. This block 29 is provided with a series of pockets 30 in one face thereof in which the lower ends of the flasks or test tubes rest. Pivoted to one longitudinal side of the block 29 is a clamping plate 31, which, when operative, rests flush upon the said block 29 and clamps the flasks or test tubes in their respective pockets 30, said plate being provided with semi-circular recesses which embrace the test tubes or flasks. In order to support the bodies of the flasks or test tubes F which project beyond the pockets 30 in the block 29, each pocket has a skeleton support comprising a loop 31 and the upright 32, the latter being secured to the block 29. As the loop 31 is spaced from the block 29 and registers with the corresponding pocket 30 thereof, it embraces the projecting portion of the test tube or flask F.

The centrifugal force created by the rotation of the head H, maintains the clamping

plate 31 flush against the block 29, keeps the flasks or test tubes F seated in their respective sockets, and prevents the holder generally from becoming displaced from its position in the yokes.

By this combination and arrangement it is possible, with a centrifuge and holders of the size illustrated, to operate upon from one to eight flasks or test tubes F. Of course if the size of the yokes 26 and the holders is increased the capacity of the apparatus will be correspondingly increased.

What is claimed is:

1. The combination with a head comprising a plurality of arms arranged in pairs, the free end of each arm being bifurcated, of a carrier coöperating with each pair of arms comprising a relatively long base portion terminating in angularly bent arms, the free ends of said arms being pivoted in the bifurcations of the arms of the head aforesaid, and means adjacent to each bifurcation for supporting the arms of the coöperating carrier when the said head is stationary.

2. The combination with a head comprising a plurality of arms arranged in pairs, the free end of each arm being bifurcated, of a carrier comprising a relatively long base portion terminating in angularly bent arms, the free ends of said arms being pivoted in the bifurcations of the arms of the head aforesaid, and a U-plate centrally secured to the base portion of each carrier.

3. The combination with a head comprising a plurality of arms arranged in pairs, the free end of each arm being bifurcated, of a carrier comprising a relatively long base portion terminating in angularly bent arms, the free ends of said arms being pivoted in the bifurcations of the arms of the head aforesaid, means adjacent to the bifurcation for supporting the arms of the coöperating carrier when the said head is stationary, and a U-plate centrally secured to the base portion of each carrier.

4. The combination with a head comprising a plurality of arms arranged in pairs, the free end of each arm being bifurcated and the rear wall of such bifurcation being oblique, of a carrier comprising a relatively long base portion terminating in angularly bent arms, the free ends of said arms being pivoted in the bifurcations of the arms of the head aforesaid, and extensions of the oblique rear walls of said bifurcations for supporting the arms of the coöperating carrier when the head is stationary.

JULIUS JOHN MOJONNIER.