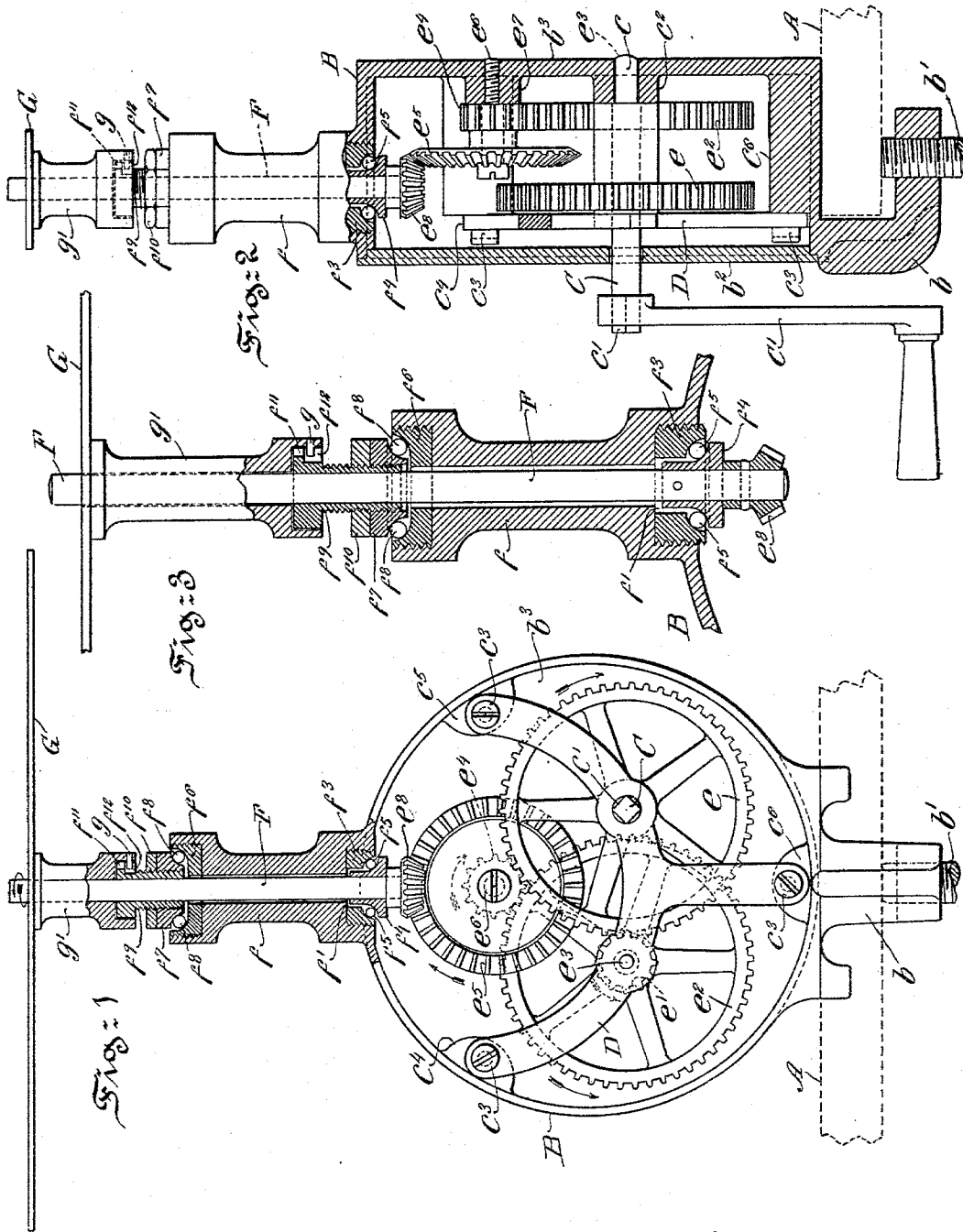


(No Model.)

F. F. METZGER.  
CENTRIFUGAL MACHINE.

No. 571,783.

Patented Nov. 24, 1896.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

FERDINAND F. METZGER, OF PHILADELPHIA, PENNSYLVANIA.

## CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 571,783, dated November 24, 1896.

Application filed January 23, 1896. Serial No. 576,528. (No model.)

*To all whom it may concern:*

Be it known that I, FERDINAND F. METZGER, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Centrifugal Machines, of which the following is a specification.

My invention has relation to a centrifugal machine for precipitating solid bodies of different specific gravities contained in fluids, or for the examination of blood, sputum, and urine; and it relates more particularly to the construction and arrangement of such a machine for said purposes.

The principal objects of my invention are, first, to provide a simple, comparatively inexpensive, and efficient apparatus for volumetric analysis and in general for bacteriological, chemical, or physiological research, and, second, to provide a centrifugal machine actuated by manual or other power at a high rate of speed and with friction on the working parts of the driven shaft of the machine reduced to a minimum and with the effective action of the same enhanced.

My invention, stated in general terms, consists of a centrifugal machine constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a view, partly in vertical central section and partly in front elevation, with the detachable cover-plate of the case or box for the gear mechanism of the machine removed and also showing, partly in broken section, the clamping device thereof, the said view embodying the general features of my present invention. Fig. 2 is a vertical section through the machine, showing the detail construction and arrangement of the gear-actuating mechanism of the machine within a case or box; and Fig. 3 is a view, partly in elevation and partly in section, showing the arrangement of the driven shaft of the machine with its ball-bearing connections and the detachable bearing of the holder for vials

or test-tubes established with the shaft by a bayonet connection.

Referring to the drawings, A represents a table or other suitable support for the machine.

B is a circular box or case wherein is mounted the gear-actuating mechanism.

b is a clamp formed integral with the box or case B and provided with a tightening-screw  $b'$ , as illustrated in Figs. 1 and 2. The box or case B is provided with a removable front cover or flanged plate  $b^2$ , as clearly illustrated in Fig. 2.

C is a cross-shaft mounted on and extending beyond the removable front plate or cover  $b^2$ . This shaft has a cylindrical portion  $c$  and a square portion  $c'$ .

The shaft C is journaled at the right-hand end in a bearing  $c^2$ , formed, preferably, integral with the rear plate  $b^3$  of the box or case B, and the opposite extremity portion of this shaft is loosely held in a Y-shaped frame D and in the removable front plate or cover  $b^2$ , and extends beyond said plate and has applied thereto a detachable hand-crank  $C'$ , as clearly illustrated in Fig. 2. This Y-shaped frame D is secured by means of screws  $c^3$  to lugs  $c^4$ ,  $c^5$ , and  $c^6$ , formed, preferably, integral with the interior of the box or case B, as clearly illustrated in Fig. 1. Rigidly mounted on the shaft C is a gear-wheel  $e$ . This wheel  $e$  meshes with a pinion  $e'$ , rigidly connected with a gear-wheel  $e^2$ , which is mounted on a shaft  $e^3$ . The shaft  $e^3$  is journaled in the Y-shaped frame D and in the rear wall of the box or case B. The gear-wheel  $e^2$  meshes with a pinion  $e^4$ , which is rigidly connected to a beveled gear-wheel  $e^5$ . This beveled gear-wheel  $e^5$  is mounted on a shaft  $e^6$ , journaled to a lug or projection  $e^7$  of the rear plate  $b^3$  of the box, case, or housing B, as clearly illustrated in Fig. 2.

$e^8$  is a small bevel-gear meshing with the large beveled gear-wheel  $e^5$ . The small bevel-gear  $e^8$  is mounted on a vertical driven shaft F, extending through a double-flanged tubular bearing  $f$ , formed, preferably, integral with the housing, box, or case B, as clearly illustrated in Figs. 1, 2, and 3.

$f'$  is a chamber formed in the lower flanged portion of the bearing  $f$  and provided with

an inverted dished ring, annulus, or plug  $f^3$ , having a threaded periphery engaging a complementally-threaded surface of the interior of said bearing  $f$ .

- 5  $f^4$  is a bonnet or cap rigidly secured to the driven shaft F, and between the slanting curved exterior surface of said bonnet or cap and the dished portion of said ring, annulus, or plug  $f^3$  are interposed balls  $f^5$ , the  
10 said members forming a ball or roller bearing connection between said annulus or plug, bonnet or cap, and shaft F. At the upper flanged portion of the bearing  $f$  is provided a dish-shaped threaded ring, annulus, or plug  
15  $f^6$ , and on said shaft F is mounted an inclined-surface bonnet or cap  $f^7$ , and between which and the annulus, ring, or plug  $f^6$  are interposed balls  $f^8$ , the said members forming a ball-bearing connection between said bonnet or  
20 cap and ring, annulus, or plug and with said shaft to reduce friction to a minimum in the rapid rotation of said shaft F in the bearing  $f$  therefor. Mounted on the shaft F is a flanged and threaded sleeve or collar  $f^9$ , engaging the bonnet or cap  $f^7$ , and with which  
25 threaded sleeve or collar engages a jam-nut  $f^{10}$ . The flanged portion of said sleeve or collar is provided with a vertical slot  $f^{11}$  and with a recess  $f^{12}$  on each side of said slot adapted to engage a pin  $g$ , projecting inwardly  
30 from the flanged tubular bearing  $g'$  of the holder G, as clearly illustrated in Figs. 1 and 3. The holder G, rigidly secured to the upper end of said bearing  $g'$ , may be of any suitable  
35 construction for containing and supporting to required position vials or test-tubes rotated in connection therewith by means of said shaft F at a high rate of speed for making tests of lacteal fluids, sputum, urine, or  
40 other matter, and for permitting of the separation by centrifugal action of solid or semi-solid matter that may be contained therein, or, in a word, for conducting bacteriological, chemical, and physiological research.

- 45 As practice has demonstrated, it is highly desirable that the friction on the working parts of a centrifugal machine for such purposes as hereinbefore explained required to be run at a high rate of speed be reduced as  
50 far as possible to a minimum, and by the arrangement of the driven shaft with ball or roller bearing connections, as hereinbefore explained, such results are insured in a most satisfactory manner.

- 55 The mode of operation of the machine hereinbefore described has been indicated by ar-

rows in Fig. 1 of the drawings to illustrate the direction of rotation of the train of gear-wheels in the case or box B, as well as the vertical driven shaft F, controlled thereby 65 as to its rotation, and therewith the holder G, of any preferred construction and arrangement, for the purposes hereinbefore explained, among others, to which the machine is applicable by the manipulation of the hand- 65 crank C' in any well-understood manner.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A centrifugal machine provided with 70 operating mechanism incased and having a removable cover, a vertical shaft provided with bonnets or caps, dished rings or plugs mounted in a flanged tubular bearing, balls 75 interposed between said bonnets or caps and rings or plugs, a flanged sleeve or collar connected with one of said bonnets or caps and provided with a jam-nut, the flanged portion of said sleeve or collar slotted and recessed 80 and a test-tube holder provided with a pin adapted to engage through the slot of said sleeve or collar with the flanged recessed portion thereof, substantially as and for the purposes described.

2. A centrifugal machine provided with a 85 vertical shaft extending through a tubular bearing having at each end thereof a ball-bearing connection, one of said connections provided with a sleeve or collar having a slot and a recess and a test-tube holder provided 90 with a pin, substantially as and for the purposes described.

3. In a centrifugal machine, a case or box having a removable cover, a clamp adapted to engage a support, a train of gears mounted 95 in said case or box, a vertical shaft supported in a bearing, both ends of which have ball-bearing connections, one of said connections provided with a sleeve or collar having a slot, a jam-nut engaging said sleeve or collar and 100 a test-tube holder provided with a bearing and a pin adapted to engage the said sleeve or collar, substantially as and for the purposes described.

In testimony whereof I have hereunto set 105 my signature in the presence of two subscribing witnesses.

FERDINAND F. METZGER.

Witnesses:

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