(No Model.)

F. H. RICHARDS.

CENTRIFUGAL MACHINE.

No. 384,718. Patented June 19, 1888.

FIG. 2.

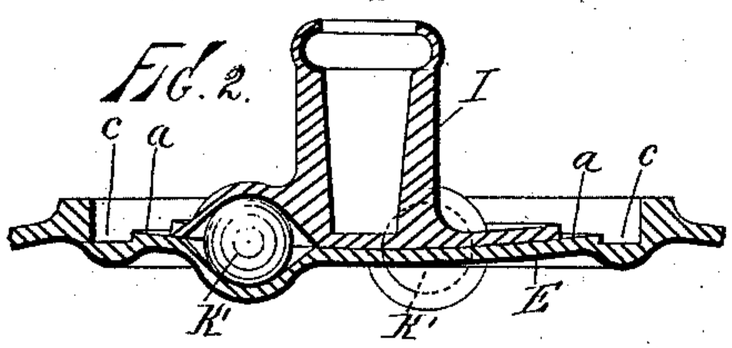

FIG. 1.

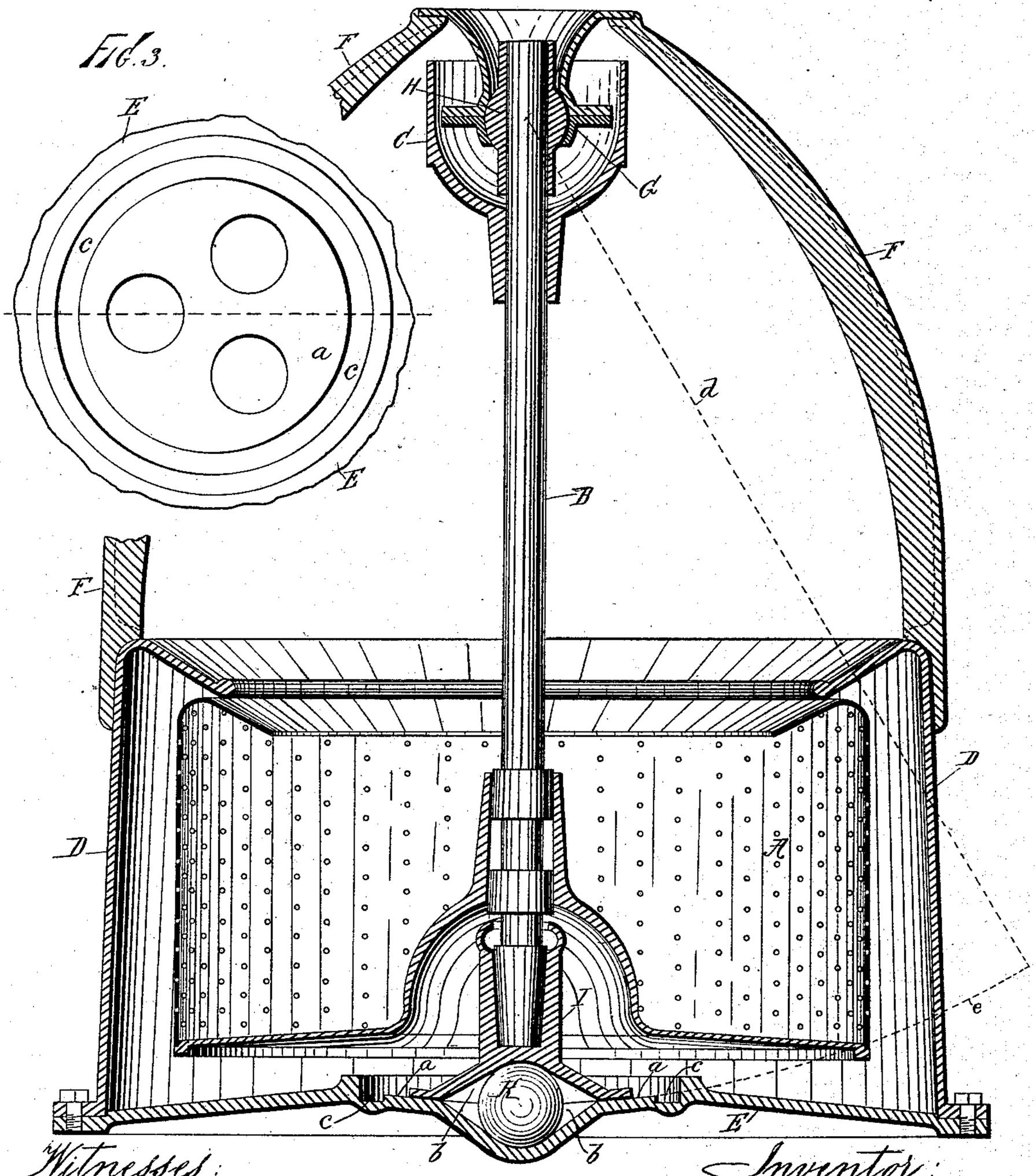

FIG. 3.

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UNITED STATES PATENT OFFICE.

FRANK H. RICHARDS, OF TROY, NEW YORK.

CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 384,718, dated June 19, 1888.

Application filed May 3, 1888. Serial No. 272,635. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. RICHARDS, of Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Centrifugal Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention has relation to that class of machines employed for discharging moisture from various articles or substances, and particularly (though not exclusively) from cloths or fabrics, through the action of centrifugal force, which machines are now commonly known as "centrifugal machines" or "whizzers."

The object of my invention is to produce a machine of the class named, in which the basket or receptacle for the goods shall automatically assume a position such that the wear and friction upon the bearings and movable parts will be uniform for any rate of speed, or for any load in which the power required to accomplish the required rapid revolution of the basket shall at all times be most advantageously applied without waste for overcoming unnecessary friction, and in which the parts shall be few and simple, easy to construct, and not liable to get out of order. To accomplish all of this, and to secure other advantages in the matters of construction and operation, my improvements involve certain new and useful relative arrangements or combinations of parts, peculiarities of construction, and principles of operation, all of which will be herein first fully described, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a sectional elevation of a machine constructed and arranged for operation in accordance with my invention and involving my improvements. Fig. 2 is a similar view of a fragment, showing the application of a number of elastic balls between the step and base or bed instead of the single ball shown in Fig. 1; and Fig. 3 is a plan of the base corresponding with that of Fig. 2.

In all the figures like letters of reference, wherever they occur, indicate corresponding parts.

A is a perforated basket or cage (usually of metal) which receives the material from which moisture is to be discharged. It is mounted upon a shaft, B, which is turned through the medium of a belt applied to a pulley, as C, or by other suitable means.

D is a stationary vessel or wall surrounding the basket or cage, and usually mounted upon any suitable base or bed plate, as E, which base in the form shown is made, also, through intervening elements, to sustain the weight of the shaft and the load it carries. The upper end of the shaft is steadied through one, two, three, or more arms, as F, which may be applied to the stationary wall D, or to the base or bed plate, the arm or arms carrying a socket, G, which receives a ball, H, applied upon the shaft. The ball-and-socket joint permits the shaft to incline, as will be readily understood. The lower end of the shaft is mounted in a step, I, which may move upon the bed-plate, and in which step the shaft revolves. The surface *a*, on which the step moves, is a portion of a sphere, its center being in the center of the ball H, so that the step is free to move over it, without raising the shaft in the upper ball, however far the lower end of the shaft may move from the vertical or central position.

Heretofore in these machines a ball-and-socket joint for the upper end of the shaft has been used, and a step for the lower end made to ride upon a curved surface having a radius shorter than the distance to the center of the upper ball, the universal joint upon which the shaft or spindle swings when there is any lateral movement. In this old form, when the shaft or spindle swings out from its central or vertical position, it has to ascend an incline—that is, it has to ascend the increasing curvature of the surface on which it rides—lifting the central shaft with the basket and its load, and the force of gravity constantly tends to return it to the central line. In my machine the lower surface of the step of course corresponds in curvature with the surface on which it rides.

My means of retaining or returning the step to its central position is provided in an elastic ball, K, placed in suitable recesses *b b* in the curved surface *a* and the under surface of the step I. If the elastic ball were not used, the spindle and basket would be free to fly out in

any direction, and would revolve as freely in one place as in another, the basket and contents being perfectly balanced; but if, as usually happens, the contents are not balanced, the tendency of the heavier side of the load, with its greater centrifugal force, is to draw the basket in the direction of the heavier side, and this it will continue to do as the basket revolves. Consequently, being free to move, it will move too far, and its movement must be controlled. If it be attempted to control this lateral movement by making the shaft revolve in fixed bearings, great friction is produced against one side of the shaft, entailing loss of power and rapid wearing of shaft and bearings; but if, while free to move laterally when the shaft and step are in a central position, a slight resistance to lateral movement be provided, and a resistance increasing as the distance from the center increases, when a certain speed is attained the loaded basket and shaft, instead of revolving around the center of the shaft, begin to revolve about the center of gravity of the combined weight, and after this, no matter how the speed of rotation increases, they will continue to revolve about their center of gravity, with little strain to any of the parts. The improved machine may thus be called, and is, a "self-centering machine," in that, in obedience to the slight check provided by the elasticity of the ball, it finds the center of gravity of the basket, with its unevenly distributed load, and establishes a free revolution about that center. A further function of the elastic ball is found in its lifting tendency or capacity. It should not be allowed to lift the step under any circumstances, as that would cause the machine to rattle, and result in injury to one or both of the curved surfaces; but the ball should be so proportioned in size and density, and the shape and size of the recesses so adjusted, that it shall not raise the step from complete contact with the curved plate. Still, when the step moves laterally from the center, the ball bears more or less against one of the inclined sides of the recess in the surface of the step and against the opposite inclined side of the recess in the lower curved plate, and between the two the elastic ball tends to lift the weight of the step, making it consequently bear more lightly and easily upon the curved plate *a*.

In this machine the lateral movement required to enable the shaft to find the center of gravity and establish its revolution about it is small, and the annular recess *c* is sunk around the edge of the curved plate *a* and below its surface, so that the edge of the base of the step may sometimes travel beyond it, and thus wear the whole surface and not leave a raised ridge unworn around the edge to interfere with its free movement. The radius of the curved plate *a* being the distance from the center of the universal joint upon which the shaft oscillates, the side of the bearing in the step is always in line or coincident with the surface of the shaft in contact with it. The shaft consequently always bears along the whole depth of the bearing in contact with it, and not against the top at one side and against the bottom at the other. There is no tendency to wear the hole larger and looser at the top and bottom of it, or the shaft smaller and looser in the same way.

Instead of the single central elastic ball K, a number (three or more) of such balls, as at K′ K′, Fig. 2, may be placed in suitable recesses in the curved surfaces equidistant from the center, and also equidistant from each other. In this case the shaft could be placed lower by a distance equal to about one-half the diameter of the central elastic ball, which would be desirable in the larger machines. The elastic balls so placed would also entirely prevent the step from revolving, leaving all the wear of revolution in the interior of the step, as provided for.

The dotted lines *d* and *e* are employed to represent the length of the radius and direction of the curved surface.

The elastic balls are preferably made of rubber, but may be made of other suitable material, or may be replaced by other and equivalent yielding devices.

Being constructed and arranged substantially in accordance with the foregoing explanations, the improved machine will be found to admirably answer the purpose or object of the invention, as previously set forth.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a centrifugal machine, the basket-shaft, combined with a movable step at its bottom, a universal joint at its top, and an elastic ball or balls for regulating the travel of the step, substantially as and for the purposes set forth.

2. In a centrifugal machine, the basket-shaft, combined with a movable step at its bottom and a universal joint at its top, said step being mounted and arranged to travel upon a curved surface of which the center is in the center of the universal joint, and an elastic ball or balls interposed between the step and base, substantially as set forth.

3. In a centrifugal machine, the basket-shaft, combined with a movable step at its bottom, and an elastic ball or balls for regulating the travel of the step, the step being mounted upon a curved surface, substantially as and for the purposes set forth.

4. In a centrifugal machine, the combination of the base and the movable step mounted thereon, said base and step being provided with recesses for receiving an elastic ball or balls, substantially as explained.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

FRANK H. RICHARDS.

Witnesses:

JOHN BUCKLER,

WORTH OSGOOD.