Sept. 20, 1960 T. E. ANDREWS 2,953,100

PERCOLATOR PUMP CONSTRUCTION

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FIG. 1.

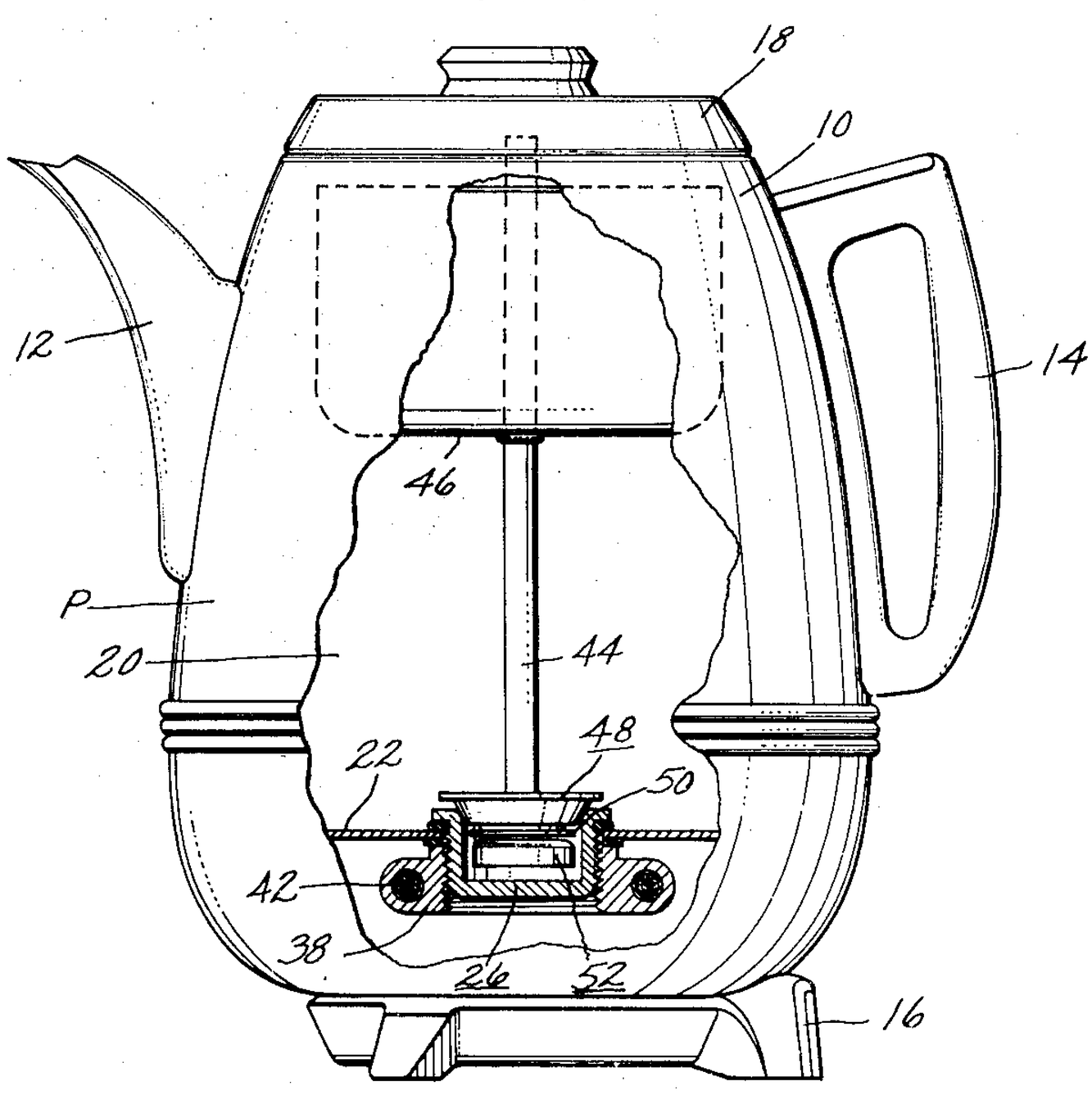

FIG. 2.

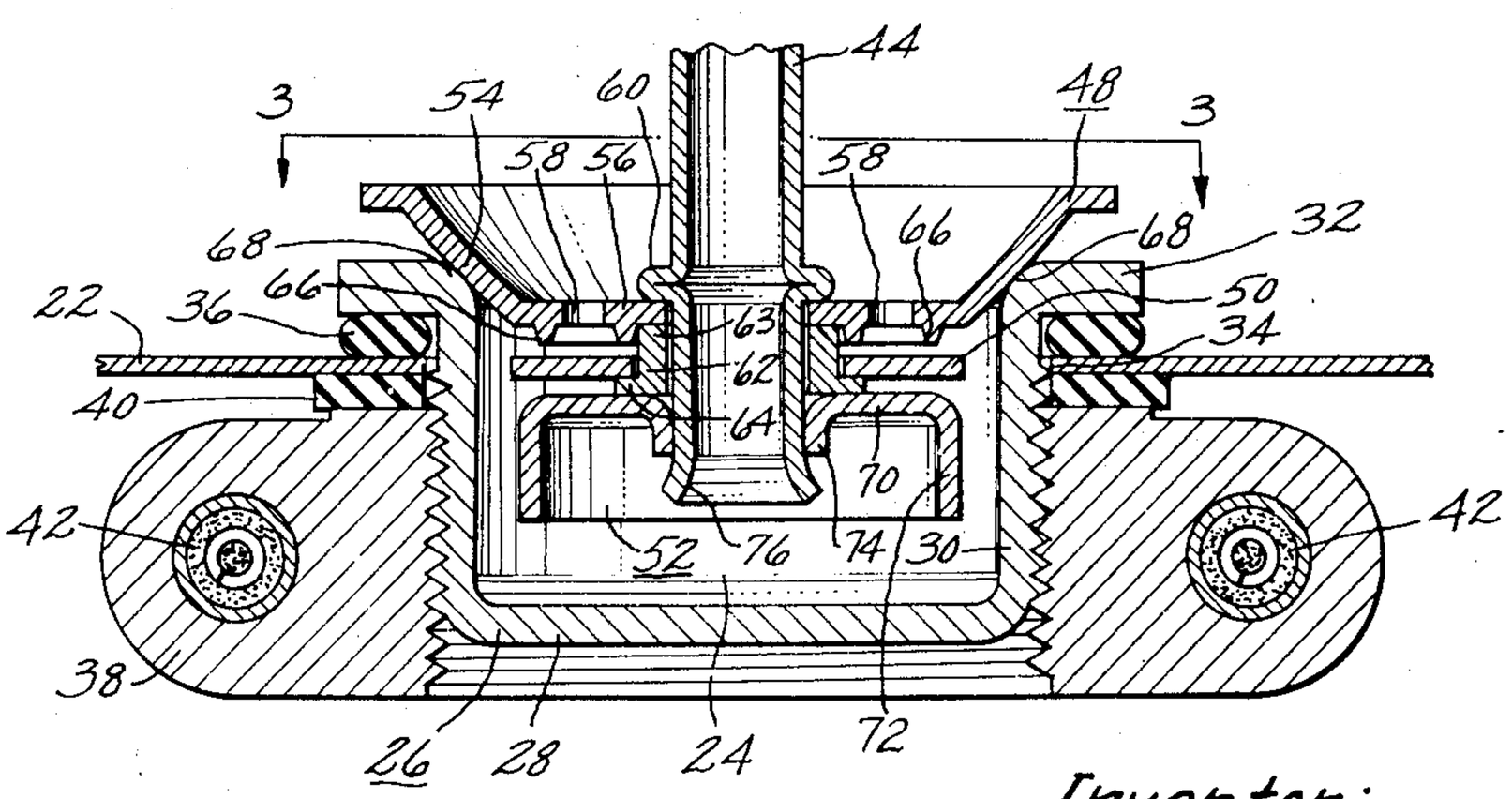

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Fig. 3.

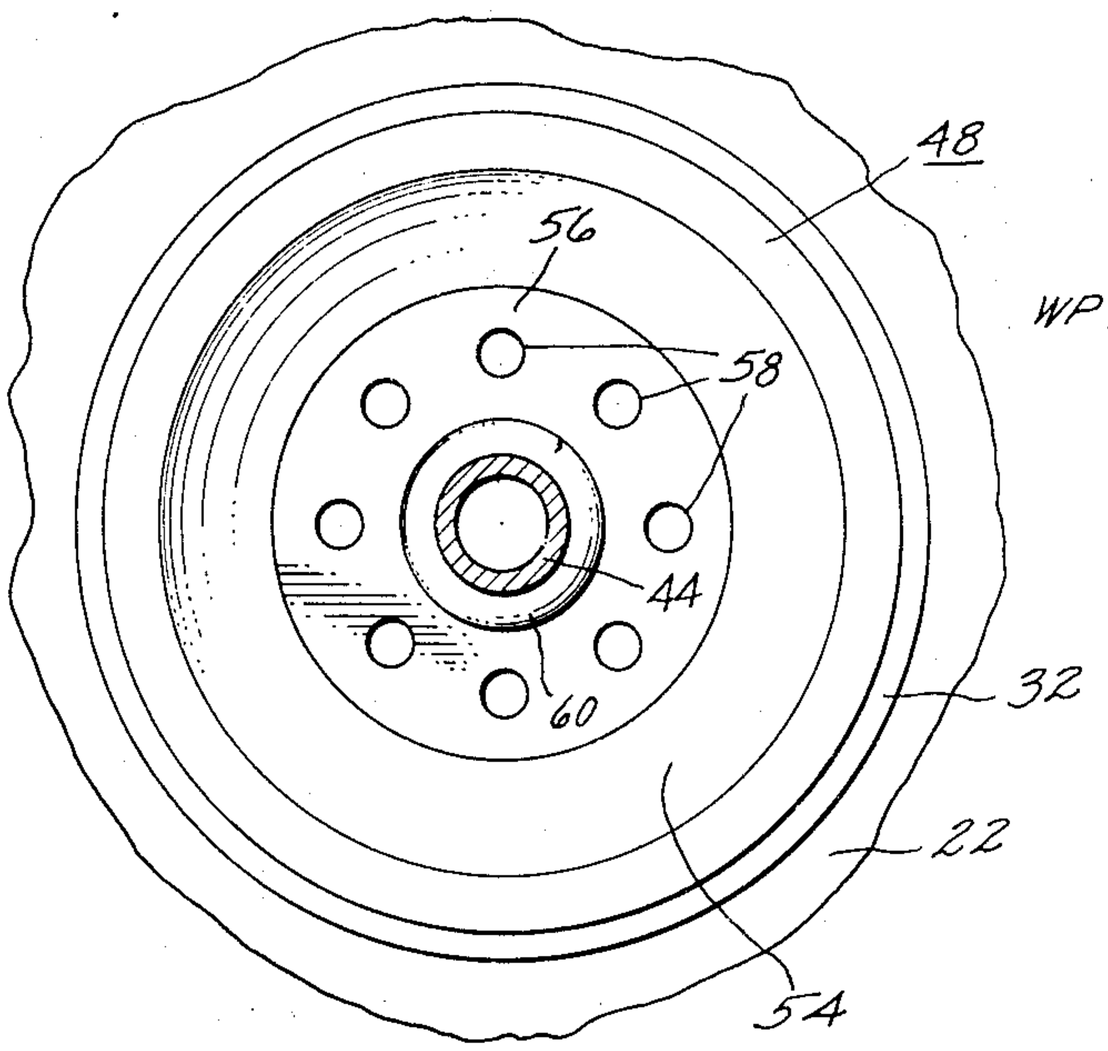


Fig. 4.

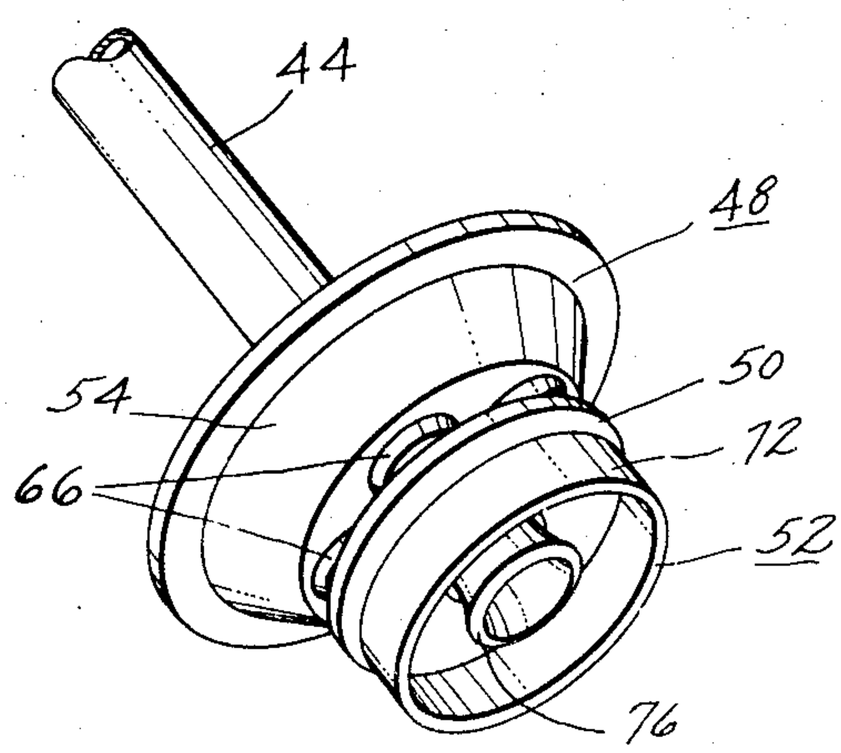


Fig. 5.

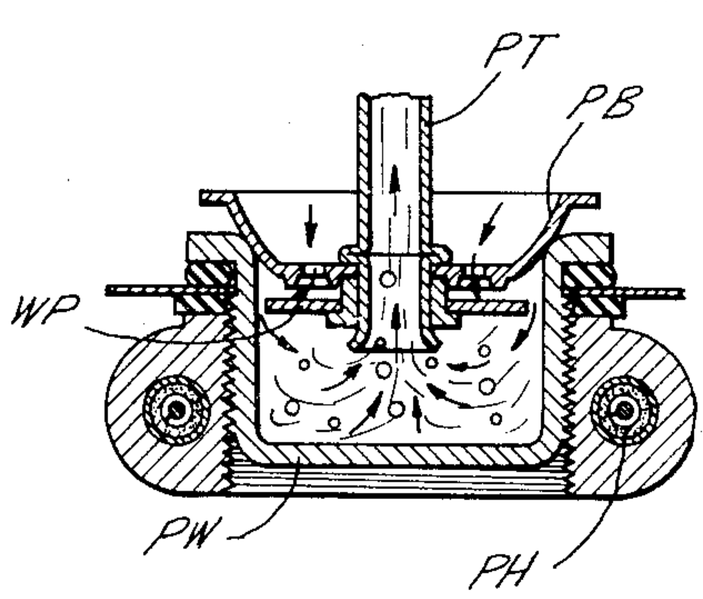
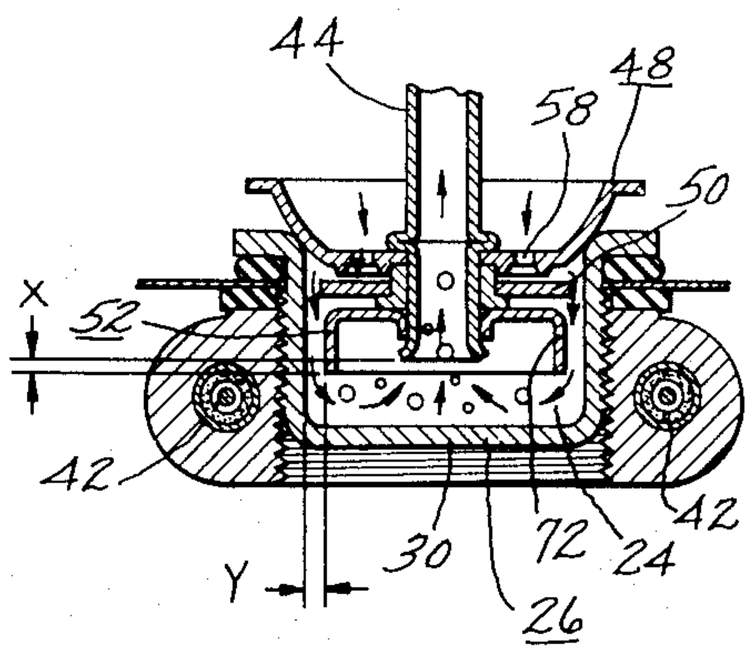


Fig. 6.



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PERCOLATOR PUMP CONSTRUCTION

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6 Claims. (Cl. 103—231.5)

The instant invention relates generally to percolators and particularly to an improvement in the means for pumping liquid in percolators during their operation.

As is well known, percolators are widely used in American homes to brew coffee, particularly during the early morning at breakfast time. When so used, it is extremely desirable that the percolator brew coffee in the quickest and quietest manner. The time required to brew coffee is largely dependent upon the efficiency, i.e., the pumping rate, of the means in the percolator for pumping liquid during operation thereof. The amount of noise made by a percolator is also largely dependent upon the construction of the means in the percolator for pumping the liquid during operation thereof. Most people have been vexed in the difficult hectic morning hours by having to wait for coffee to brew and/or by being disturbed by having to listen to a noisy percolator brewing coffee. The percolator art has recognized the seriousness of the problems of: (1) lack of speed, and (2) presence of noise in existing percolators, and as a result much effort has been directed toward eliminating them. Notwithstanding this effort, it is not believed that a sufficiently quick and quiet percolator has been heretofore developed.

It is an object of this invention to provide an improved percolator that includes improved liquid pumping means which is both efficient and quiet in operation.

It is another object of this invention to provide an improved liquid pumping construction for a percolator which affords practical operational conveniences in assembling the parts for use, in removing some of the pumping parts and temporarily resting them outside of the percolator, and in ease of cleanability.

The objects of this invention are achieved in one form by the provision in a percolator having a pump well of a pump assembly which includes an elongated pump tube which has an apertured pump body fixed to it near its lower end, a washer which is movably mounted on the pump tube adjacent to the pump body and is adapted during operation to periodically close the apertures in the pump body in a manner which is known to the percolator art, and a cup-shaped pump baffle which is rigidly secured to the pump tube adjacent the washer. The configuration, dimensional relationship and disposition of the pump assembly parts are such as to effect a temporary pump construction when the pump assembly is operatively associated with the pump well which differs from known percolator pump constructions principally in that it includes the referred-to, cup-shaped pump baffle, which has portions which extend downwardly beyond the lower end of the pump tube and which are generally uniformly spaced from the pump tube and the side walls of the pump well.

The above and other objects and further details of that which I believe to be novel and my invention will be clear from the following description and claims taken with the accompanying drawings wherein:

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Fig. 1 is an elevation view, with portions broken away and shown in section for the sake of clarity, of a percolator which incorporates the improved pump construction;

Fig. 2 is a vertical sectional view of the pump construction shown in Fig. 1 on an enlarged scale;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary perspective view of the pump assembly, particularly showing the lower end thereof;

Fig. 5 is a schematic view of a currently widely used, prior art pump construction showing the operation thereof; and

Fig. 6 is a schematic view similar to Fig. 5 showing the improved pump construction.

By reference to the drawings, and particularly Fig. 1, it will be seen that the improved pump construction may be incorporated in a percolator, such as the one indicated generally by reference character P, which includes the body **10**, the spout **12**, the handle **14**, the base **16**, and the lid **18**. Within the percolator there is formed a liquid reservoir **20** which is defined by a major portion of the percolator body, the lid and an interior, horizontal, bottom wall **22**. It will be understood that notwithstanding the fact that the illustrated percolator is one of the automatic electric type, this being the preferred type, that the improved pump construction can be utilized in any percolator and does not necessarily have to be used in an electric or automatic one.

The illustrated percolator includes a pump well **24** which depends below the bottom wall **22**. The pump well is formed by pump well cup **26** which comprises circular well bottom wall **28**, cylindrical well side walls **30** and an annular mounting flange **32**. It will be observed, particularly in Fig. 2, that the pump well cup **26** may be inserted from above through the opening **34** in the percolator bottom wall **22** and have its flange **32** supported on the portions of the percolator bottom wall **22** which surround the opening **34** with an annular sealing gasket **36** compressed therebetween. It will also best be seen in Fig. 2 that the lower exterior surface portions of the well side walls **30** are threaded and co-operate with internal threaded portions of the pump heater member **38** to mount the latter on the lower side of the percolator bottom wall **22** with the sealing gasket **40** compressed between the pump heater member and the lower side of the percolator bottom wall.

The pump heater member **38** includes the heater **42**, which may be of the widely used sheathed electrical resistance heater type, which is embedded in said member. The construction of the percolator and pump well described thus far is well known, as is the practice of utilizing with such construction a pump assembly comprising a vertically extending pump tube, such as illustrated pump tube **44**, which supports a removable coffee basket, such as the illustrated coffee basket **46** near its upper end, and a rigidly mounted, apertured, dished, disc-like pump body and associated movable pump washer, such as the illustrated parts **48** and **50**, respectively, near its lower end. The manner in which the pump well construction and a pump assembly of the type set forth thus far co-operate to produce pumping operation in a percolator is well known. This general type of percolator pump construction is widely used in practice and is generally disclosed in many prior art patents, for example, in U.S. Patent No. 1,922,546 (Fig. 3). It has been found in practice that percolators including this type of known pumping construction: (1) operate in a noisy manner which is characterized by periodic loud thumping noise, and (2) do not have an entirely satisfactory pumping rate. It has been found in practice that the addition of another particular structural element to the known pump assembly con-

struction in a particular manner substantially eliminates the objectionable thumping noise inherent in the known constructions and increases the pumping rate appreciably, thereby reducing the amount of time required to brew coffee. This particular element has been designated as a pump baffle and, as illustrated, takes the form of an inverted, cup-shaped member **52**, which is rigidly secured to the pump tube **44** near the latter's lower end.

It will be observed in Fig. 2 that the referred-to pump body **48** includes the dished-portion **54** and the central flat portion **56** which has a plurality of spaced openings **58** formed therein. It will also be observed in Fig. 2 that the pump body **48** is rigidly connected to the pump tube **44** between and by the annular bead **60** formed on the pump tube and the hub **63** of collar **62**, which in turn is rigidly mounted on the pump tube. It will also be observed that the pump washer **50** is mounted on the exterior of the hub **63** of the collar **62** so as to be freely slidable thereon between the limits fixed by the flange **64** of said collar and the circular bosses **66** formed on the lower side of flat portion **56** and which surround the openings **58**. Lastly, it will be observed that the pump assembly is adapted to be temporarily removably positioned in the percolator body in such a manner that circumferential portions of the outer surface of the dished portion **54** of the pump body **48** rest on the circular valve seat **68** formed in the general vicinity of the intersection of the cylindrical well side walls **30** and the flange **32** of the cup-shaped pump member **26**. When mounted in this manner, the pump well **24** becomes a pumping chamber which is adapted to periodically communicate with the reservoir **20** through the openings **58** during operation of the percolator, all in a known manner.

Rigidly secured to the pump tube **44** near the latter's lower end is the previously mentioned pump baffle **52**. The pump baffle performs vital, novel functions and includes the flat annular portion **70**, the cylindrical peripheral skirt **72** and the central cylindrical mounting flange **74**. The pump baffle is secured tightly on the pump tube **44** near the latter's lower end by a press fit caused by the outwardly flared tube end **76**, which in actual practice may serve as a convenient means for securing all of the parts carried by the lower end of the pump tube.

When the improved pump assembly is mounted in the percolator body, the parts are disposed as illustrated in Fig. 2. In these positions, it should be noted that the following conditions obtain: The pump body **48** rests on the valve seat **68** and co-operates with the pump well member **26** to transform the pump well **24** into a substantially closed pump chamber. The pump washer **50** is freely slidable on the hub **63** of collar **62** for vertical movement between the collar flange **64** and the bosses **66**. When the pump washer **50** is in its lowermost position, illustrated in Fig. 2, the interior of the percolator reservoir **20** communicates with the interior of the pump chamber formed by the pump well **24** through the openings **58**. It will be understood that if liquid is in the percolator reservoir **20** and the pump construction is in the Fig. 2 condition, that liquid will flow through the openings **58** into the pump well and fill the latter. It will also be observed that when the pump washer **50** is moved to its uppermost position (not shown) during operation of the percolator by the pressure of steam generated within pump well **24** each time a charge of water enters the well and is heated by heating element **42**, the washer **50** contacts the bosses **66** and temporarily discontinues communication between the percolator reservoir **20** and the pump well **24**. It will be understood that the outer diameter of pump washer **50** and the inner diameter of pump well **24** are so proportioned that as steam is generated in the well the pressure on the underside of washer **50** exceeds the pressure on the upper side thereof, and that it is this pressure differential which causes washer **50** to move to its uppermost position. Further, this

steam pressure causes water in tube **44** to be forced up through the open end thereof, whereupon the open upper end of the tube is exposed to atmospheric pressure thus equalizing the pressure in reservoir **20** and pump well **24**. When this occurs pump washer **50** returns to its lowermost position, and the cycle is repeated. The foregoing conditions obtained in the prior art pump construction alluded to previously. The following conditions relating to the pump baffle are novel and significant: The cup-shaped pump baffle **52** is disposed within the pump chamber formed by the pump well **24** in such a manner that its skirt **72** is disposed substantially co-axially with the cylindrical pump side walls **30** and the pump tube **44**, is spaced uniformly within said cylindrical pump side walls, and is spaced about said pump tube. Also, the lower edge of the skirt **72** of the pump baffle extends downwardly beyond the lower end **76** of the pump tube **44**.

In order to fully appreciate the significant differences in structure and operation of the prior art construction and the improved construction contemplated by the instant invention, it is believed desirable to first review the manner in which the prior art pump construction operates. This operation is illustrated schematically in Fig. 5, wherein it will be observed that during operation of the percolator, a charge of water flows down through the openings in the pump body PB from the percolator reservoir into the pump well chamber PW when the pump washer WP is in its lowermost position, and that on being heated by the heater PH, the water in the pump well chamber is agitated and bubbles of steam are formed which cause an increase of pressure in the pump well chamber forcing the water up the pump tube PT. When this occurs, the pump washer WP moves upwardly and temporarily closes the openings in the pump body PB. As the heated water moves upwardly through the pump tube PT, pressure within the pumping well chamber PW will diminish to the point wherein it is less than that within the reservoir. At this time, the pump washer WP moves downwardly and allows cold water to enter through the pump body openings into the pump well chamber PW. The condition which exists at this time during operation of the prior art pump construction is illustrated in Fig. 5, wherein it will be observed that the newly admitted cold water, indicated by the schematic arrows which are pointing downwardly, meets with the heated water and steam which remains in the pump well chamber from the previous charge and which is being moved upwardly, and a considerable amount of turbulence results. It is the sudden clash of newly admitted cold water with the remaining heated water and steam which is believed to cause both a temporary slowing down of the pumping rate and the thumping noise which is characterized by the prior art pump construction.

The operation of the improved pump construction is illustrated in Fig. 6, which illustrates the condition during the point in operation which correspond to the point of operation of the prior art construction illustrated in Fig. 5. In other words, Fig. 6 illustrates the condition of the improved pump construction at the time of operation during the terminal portion of pumping upwardly a charge of water when the pressure within the pump well chamber formed by pump well **24** has diminished and cold water is admitted from the reservoir through the openings **58** in the pump body **48**. The downwardly flowing cold water is indicated by the downwardly directed schematic arrows, and the upwardly flowing heated water and steam which remains from the previous charge is indicated by the upwardly directed schematic arrows and bubbles. It will be seen in Fig. 6 that relatively no turbulence results from the mixing of the newly admitted cold water for the next charge of water to be heated and pumped, and the exiting heated water and steam from the previous charge.

In fact, because of the operation of the improved pump construction, and principally due to the benefits which flow from the incorporation of the cup-shaped pump baffle **52**, the operation is so smooth that there are not any distinct charges of cold water that are heated and then pumped off. This obtains, because the incoming cold water which flows through the openings **58** is directed outwardly by the pump washer **50** and downwardly between skirt **72** of the pump baffle **52** and the cylindrical well side walls **30** of the pump well member **26**. During its downward flow, the newly admitted cold water is warmed up, and by the time it reaches the lower part of the pump well **24**, that is, the part below the lower edge of the skirt **72** of the pump baffle **52**, it has been substantially heated; therefore, there is no sudden contact or clash between cold water and heated water and steam as is the case in the prior art pump construction. When in the lower part of the pump well, the newly admitted, warmed water mixes with the heated water remaining from the previous charge of water, is heated further and pumped off; this overall operation, in effect, provides for a smooth transition of the newly admitted water from its cold state to its heated state when it is pumped up through the tube **44**. This provides the dual benefits of smoothing out the pumping operation and thereby increasing the pumping rate and efficiency of the pump construction, and of eliminating the objectionable thumping noise which periodically is made by the prior art pump construction.

It has been found in practice that in order to achieve most successful results, certain particular dimensional relationships between some of the parts of the pump construction must be maintained. Two such dimensional relationships are indicated in Fig. 6; the dimension indicated as X, which represents the vertical distance between a plane passing through the lower edge of the pump tube **44** and a plane passing through the lower edge of the pump baffle skirt **72**, must fall within the range of .030 in. to .050 in., and the dimension indicatetd by Y, which represents the radial distance between the outer surface of the skirt **72** and the inner surface of the cylindrical well side walls **30**, must fall within the range of .070 in. to .090 in. In practice, the two specific dimensional relationships set forth were found to be necessary in order to fully achieve the objects of this invention, when they were incorporated in a pump construction having the following dimensional relationship: the pump well had a diameter of 1.00 in. and a depth of .625 in.; there were eight openings in the pump body which were circumferentially spaced on a circle having a diameter of .562 in.; and the pump washer had a diameter of .828 in., a thickness of .047 in., and was movable an axial distance of .015 in.

Although the principal objects of eliminating objectionable noises inherent in prior art pump constructions and increasing the pump rate thereof are fully accomplished by the improved pump construction disclosed, it is believed important that several subsidiary advantages of the improved pump construction also be recognized: (1) One fault of the prior art construction illustrated schematically in Fig. 5 is that it is difficult to properly locate the removable pump assembly with relation to the pump well when initially assemblying the percolator for use. It is, of course, necessary that a good tight seal be effected between the pump body and the seat formed by the pump member. The presence of the cup-shaped pump baffle in the improved pump construction provides an effective means for positively locating the pump assembly with regard to the pump well, and substantially eliminates the possibility of misalignment of these parts; (2) The addition of the pump baffle does not in any way detract from easy cleanability of all surfaces of the pump assembly. It will be understood that this is important in a coffee percolator wherein it is undesirable to permit coffee grounds to become embedded in functioning parts,

and (3) It will be observed in Fig. 5 that when removing the pump assembly of the prior art construction, let us say, after coffee has been brewed and it is desired to reheat the coffee without the pump assembly and coffee basket being present in the percolator receptacle, that there is no convenient way of removing these parts and placing them on a kitchen surface. This problem does not exist when using the improved construction, because the lower edge of the cup-shaped pump baffle provides a handy means for resting the pump assembly with the coffee basket mounted thereon on a kitchen surface when it is desired to remove it from the percolator.

As will be evident from the foregoing description, certain aspects of my invention are not limited to the particular details of construction of the example illustrated, and I contemplate that various other modifications and applications will occur to those skilled in the art. It is, therefore, my intention that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a percolator comprising: a liquid reservoir; a pump well including side walls below said reservoir; said pump well having an opening placing said reservoir and said pump well in communication with each other; means thermally associated with said pump well for supplying heat to the side walls thereof; an elongated pump tube adapted to be removably mounted in said reservoir; a pump body rigidly secured to said pump tube near an end thereof and adapted to temporarily substantially close said opening when said pump tube and said pump body are mounted in said reservoir for operation and thereby temporarily disrupt communication between said reservoir and said pump well; said pump body including means for placing said reservoir in limited communication with said pump well; and movable valve means supported on said pump tube adjacent to said pump body for periodically rendering said pump body means inoperative to place said reservoir and said pump well in communication; whereby during operation of said percolator, small amounts of cold liquid from said reservoir periodically flow through said pump body into said pump well where they are heated by said heating means and pumped up through said pump tube, that improvement comprising a pump baffle rigidly secured to said pump tube near said pump tube end and located below said valve means when said pump tube is mounted in said reservoir; said pump baffle having a skirt portion which encompasses said pump tube end and which extends below said pump tube end when said pump tube is mounted in said reservoir; and said pump baffle being encompassed by said pump well so as to cause said small amounts of cold liquid to flow downwardly between said baffle skirt and the heated side walls of said pump well for a substantial distance before flowing inwardly toward said pump tube end, whereby shortly after operation of the percolator commences the cold liquid is warmed after it enters said pump well but before it contacts the heated liquid remaining centrally in said pump well from the previous amount that has been heated and pumped off and thereby mixes with it without creating any appreciable amount of turbulence, thereby minimizing noise and any tendency to retard the pumping rate.

2. A device as defined to claim 1 wherein said pump baffle comprises an inverted cup-shaped member and includes a peripheral wall surface that is spaced from said pump tube and the walls which form said pump well, and extends downwardly below said pump tube end when said pump tube is mounted in said reservoir.

3. A device as defined in claim 2 wherein said well and said pump baffle are both generally cylindrical and a predetermined dimensional relationship exists between some of the parts which is proportional to the following: the pump well diameter is 1.00 in., the pump well depth

is .625 in., the radial distance between said peripheral wall surface and said pump well forming walls falls in the range of .070 to .090 in., and said peripheral wall extends below said pump tube end a distance falling in the range of .030 to .050 in.

4. A device as defined in claim 1 wherein said pump well has cylindrical side walls and said baffle comprises an inverted cup-shaped member having a flat wall that extends radially away from said pump tube toward said cylindrical side walls and a downwardly extending cylindrical wall which is uniformly spaced within said cylindrical side walls and extends downwardly below said pump tube end when said pump tube is mounted in said reservoir.

5. A percolator comprising: walls forming a liquid reservoir and a cylindrical pump well which is disposed below said reservoir and communicates therewith; means connected to said pump well for heating the walls thereof; a circular seat formed by the intersection of said pump well and said reservoir; a removable pump assembly adapted to be temporarily mounted in said reservoir during operation of said percolator; said pump assembly comprising an elongated pump tube; a disc-like pump body having apertures therein rigidly secured to said pump tube near one end thereof; a pump valve washer slidably mounted adjacent to said pump body and arranged to periodically close the apertures in said pump body during operation; and a cup-shaped pump baffle rigidly secured to said pump tube between said one tube end and said pump valve washer; said pump baffle having a cylindrical skirt that extends beyond said one tube end; whereby when the pump assembly is mounted in said reservoir in operative position, said pump body seats on said circular seat, said pump valve washer, said pump baffle and a portion of said tube including said one tube end are disposed within said pump well, the remainder of said pump tube extends upwardly above said pump well into said reservoir, and said pump baffle skirt is co-axial with and spaced within the heated walls of said pump well, and extends downwardly beyond said one tube end.

6. A device as defined in claim 5 wherein a predetermined dimensional relationship exists between some of the parts which is proportional to the following: the pump well diameter is 1.00 in., the pump well depth is .625 in., the radial distance between said skirt and the inner side surface of said pump well falls in the range of .070 to .090 in., and said skirt extends below said one tube end a distance falling in the range of .030 to .050 in.

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