Nov. 4, 1952 W. B. CRAMER 2,616,094

TRAP FOR TOILET BOWLS

Filed Sept. 2, 1950 2 SHEETS—SHEET 1

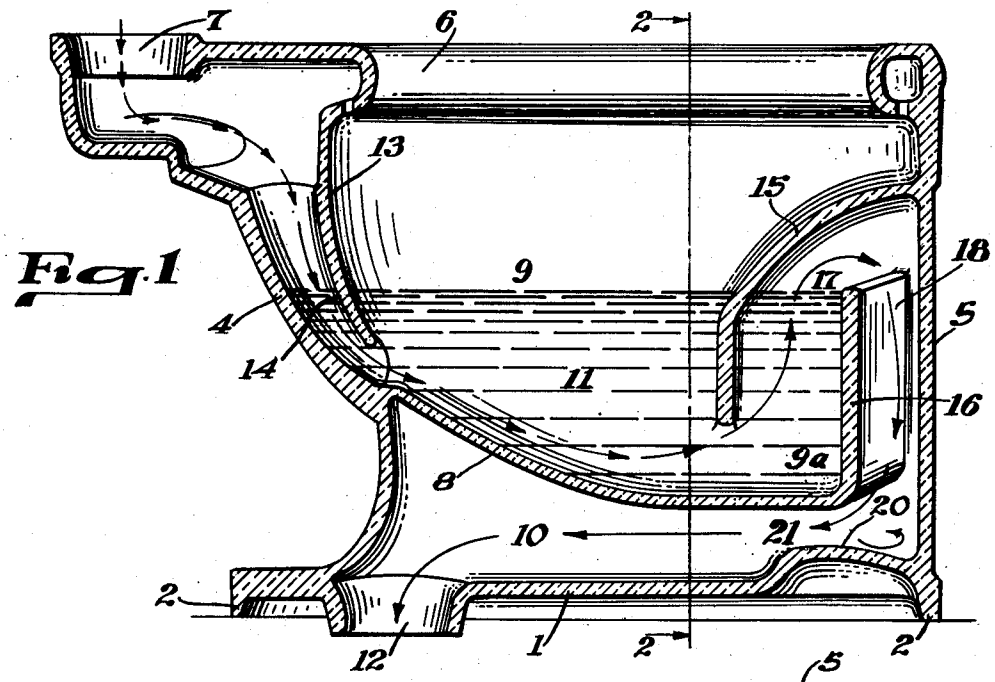


Fig. 1

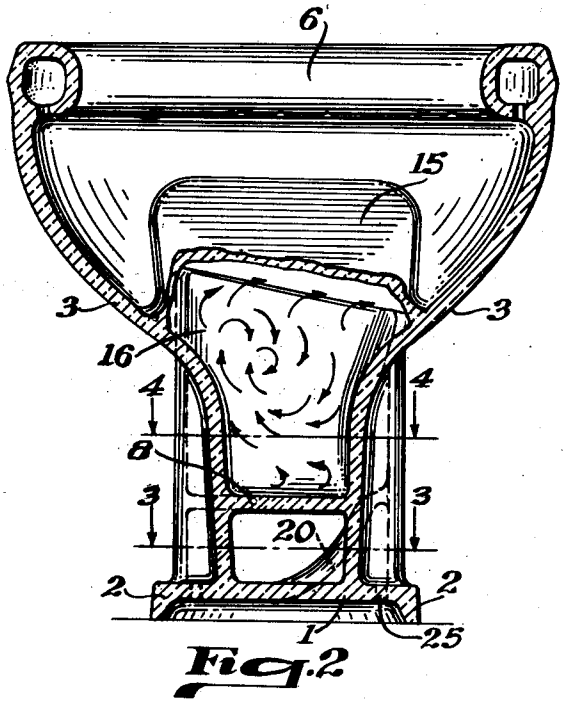


Fig. 2

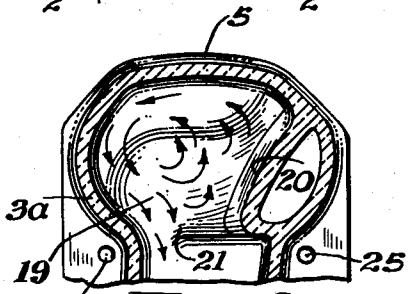


Fig. 3

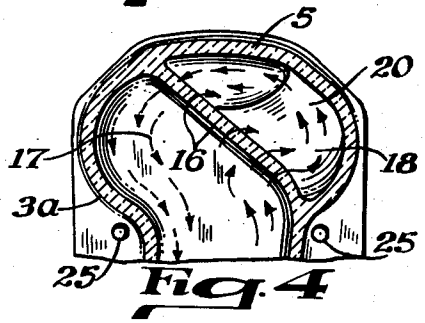


Fig. 4

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TRAP FOR TOILET BOWLS

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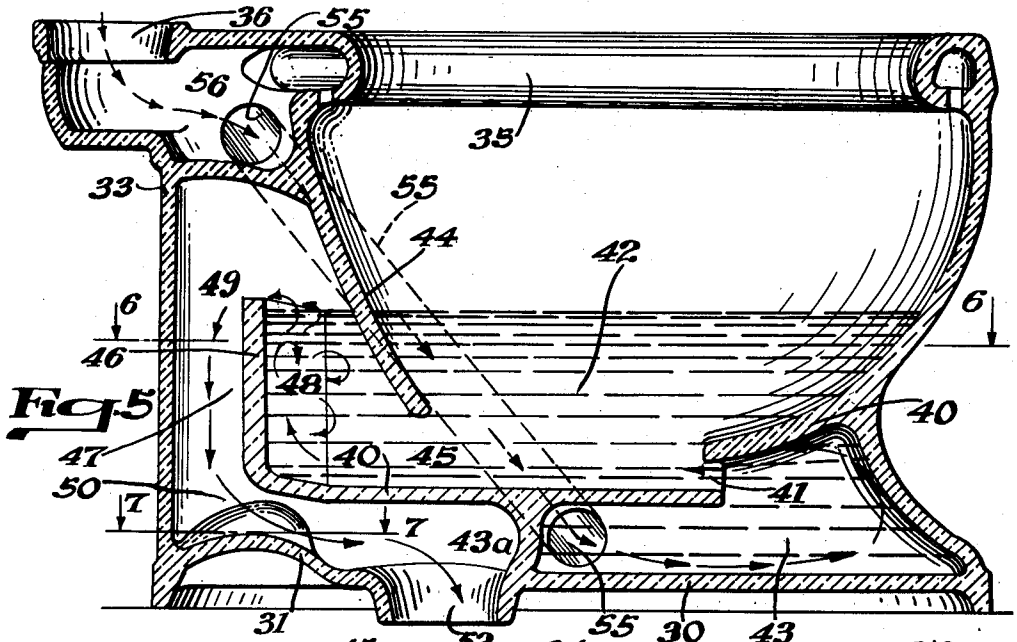


Fig. 5

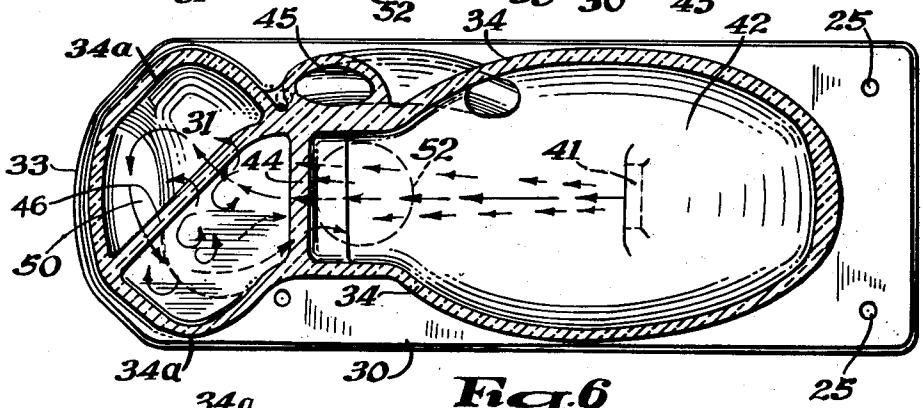


Fig. 6

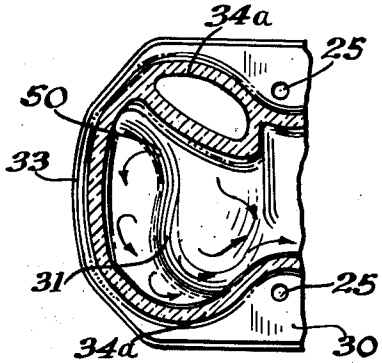


Fig. 7

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TRAP FOR TOILET BOWLS

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Application September 2, 1950, Serial No. 182,940

9 Claims. (Cl. 4—69)

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This invention relates generally to water closet bowls and is particularly concerned with a new trap for such bowls of the wash down, reverse trap and siphon jet types.

Commercial standards which have been set up by manufacturers, distributors and users in cooperation with the Commodity Standards Division of the National Bureau of Standards specify certain minimum dimensions. The trap specifications for the wash down and the reverse trap types of water closet bowls are that the minimum depth of water seal must be 2½ inches and the siphon trapway must pass a 1½ inch diameter solid ball. In the siphon jet type of water closet bowl the minimum depth of water seal is 3 inches and the siphon trapway must pass a 2⅛ inch diameter solid ball.

Since it is necessary to insure complete emptying of the bowl each time it is flushed and it is also desirable or even necessary to conserve water, manufacturers have resorted to constructions which are designed to limit the velocity of flow of water into a discharge passage and maintain the siphon effect during the emptying of the bowl. One form of such construction included a discharge passage bent forwardly and backwardly so as to increase the flow friction and limit the outlet velocity to such an extent that the siphon effect would not be broken and the water would not be withdrawn from the bowl at a faster rate than it enters the bowl from the tank. This particular form of construction and other types of construction have employed siphon trapway passages which are not substantially larger than the 1½ inch or 2⅛ inch dimensions which are required by the specifications as just stated. Such a restricted and tortuous passage may be made either as a separate outlet trap defined by separate outside supporting walls or by drawing the outside supporting walls together laterally to a point where they may become the sides of the outlet.

When the trap is made by using separate outside walls, the bowl is unduly expensive to make. When the walls are drawn laterally toward each other, the supporting pedestal under the bowl at the location of the trap is narrowed and there is considerable tendency for the bowl to warp laterally during firing. Any such warping can be compensated for only by grinding off the lower edge of the base or foot so that the top of the bowl will be substantially level but such grinding adds to the cost and in some cases the warpage is so great that even grinding will not salvage the piece.

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The restriction of the cross-sectional area of the outlet passage substantially to the minimum permissible dimensions is a disadvantage because elongated articles flushed out of the bowl may lodge within the trap from which they may not be easily removed.

The present invention aims to overcome the foregoing difficulties and accomplishes these aims by providing a trap which is of much larger cross-sectional area than the present prescribed minimum sizes, but which will maintain the required siphon effect.

The large trap permits free passage therethrough of any solid article which can move thereinto and will accommodate, in this respect, solid articles much longer than the longest that may now be accommodated with standard size outlet passages. It requires no more water than the present bowls and permits the degree of flow retardation to be varied in a wide range without any change in the cross-section of the outlet passage. It also affords such support to the bowl as substantially to prevent marked or serious warpage.

The present invention will be better understood by those skilled in the art from the following detailed description and the accompanying drawings, in which:

Fig. 1 is a vertical, sectional view taken on the longitudinal central plane of a water closet bowl of the wash down type embodying one form of the present invention;

Fig. 2 is a vertical, cross-sectional view taken one line 2—2 of Fig. 1;

Figs. 3 and 4 are horizontal, sectional views taken on lines 3—3 and 4—4, respectively, of Fig. 2;

Fig. 5 is a vertical, sectional view taken on the longitudinal central plane of a water closet bowl of the reverse trap type embodying the present invention in a modified form;

Fig. 6 is a horizontal, sectional view taken on line 6—6 of Fig. 5; and

Fig. 7 is a horizontal, sectional view taken on line 7—7 of Fig. 5.

In Figs. 1 to 4 the water closet shown comprises a rectangular foot or bottom wall 1 having a marginal flange 2 to rest on a floor, a bowl including upwardly and outwardly extending side walls 3 and a rear wall 4 and a trap including front wall 5 and parts of walls 3. The walls 3 and 4 are united at their upper ends to a perforated rim 6 communicating with an opening 7 through which water may enter from a tank or flush valve (not shown). The side walls 3 rise

from the foot 1 some distance back from its side edges but curve outwardly as at 3a toward those side edges near the front end of foot 1 where they become substantially vertical and join with vertical wall 5 to form a wall which defines a substantially vertical tubular space.

A cross wall 8 extending between side walls 3 and forwardly from rear wall 4 partly defines on its upper side a water-retaining chamber 9 and well 9a. This wall 8 cooperates with side walls 3 and foot 1 to define a waterway 10 through which flowing from well 9a through the trap may escape to a horn or sewer outlet 12.

An inner, downwardly extending wall 13 disposed adjacent to rear wall 4 serves to define therewith a jet passage 14 through which water from the tank may flow into the water-retaining chamber 9.

A slab 15 extends inwardly and downwardly from front wall 5 toward wall 8. At its forward end wall 8 is joined to a vertical wall or dam 16 which is connected at its sides to one wall 3a and to front wall 5 and extends across the tubular vertical space within walls 3a at an acute angle to the longitudinal central plane of the bowl and divides that space into two passages 17 and 18 which are of substantially equal horizontal cross-sectional area and each of which has a long axis and a short axis.

The upper edge of wall 16 is inclined downwardly toward the bowl and its lower edge is near but above a laterally sloping surface 20 of part of foot 1.

The passage 17 communicates in its lower portion near one end of its long axis with the water-retaining chamber 9 through the space between the lower edge of slag 15 and the upper surface of wall 8. This passage 17 communicates at its upper end over the top of dividing wall 16 with the other passage 18 and the latter passage communicates in its lower portion near one end of its long axis with a turbulence chamber 19. The walls 3a, surface 20 and the part of wall 8 above surface 20 define the turbulence chamber 19 which receives water from passage 18 and discharges it through outlet 21 into waterway 10.

From the foregoing description and the drawings, it will be understood that the short axis of each of passages 17 and 18 is equal to the minimum dimension required by the above stated specifications, i. e., a 1½ inch diameter solid ball will pass between walls 8 and 15 into the lower end of passage 17 and will move upwardly through that passage and will also move downwardly in passage 18 and through the turbulence chamber 19 into waterway 10. It will also be understood that the long axis of each of these passages is much greater than the short axis and that due to this greater length, articles longer than 1½ inch may pass through passages 17 and 18. In general, it may be stated that any article which can move from the water-retaining chamber 9 into passage 17 will move through passages 17 and 18, turbulence chamber 19 and waterway 10. This insures against the lodging of solid articles in the trap whence they cannot be readily removed.

It will be noted from Fig. 1 that wall 5 and the adjacent side walls 3a are substantially vertical, and are nearly as wide as foot 1 and, thus afford good support for the bowl against warping.

The foot 1 is preferably rectangular and has holes 25 for hold-down means such as bolts extending therethrough some little distance back from its side edges, the walls 3 rising from the foot between such holes.

The siphon is maintained in the trap just described, despite its enlarged cross-sectional area, by reason of the new actions and motions of the outflowing water which result from the combination and arrangement of parts constituting the trap.

The operation of the apparatus of Figs. 1 to 4 is substantially as follows:

When water is brought into the bowl from the tank through jet 14, it flows across chamber 9 into well 9a and is there deflected by wall 16 laterally toward wall 3a at the farther end of the long axis of chamber 17. When the thus flowing stream strikes wall 3a it is deflected upwardly and forces water out of passage 17 over the top edge of wall 16. Since the upper edge of this wall is inclined downwardly from its forward end toward chamber 9, water tends to flow first and in considerable volume over the part of wall 16 above the laterally inclined surface 20 of foot 1. Some of the upwardly deflected stream of water in passage 17 tends to flow downwardly, i. e., clockwise along the wall 16 and thus creates eddy currents and considerable turbulence in the passage with the result that the opening from chamber 9 into chamber 17 is sealed against loss of the siphon effect throughout the time that water is entering through jet 14. The water which flows downwardly in passage 18 and is intercepted by the laterally inclined wall 20 is thereby directed laterally across the lower part of that chamber against the front wall 5 and the side wall 3a which define that passage. Since this latter wall is curved, it induces a counterclockwise rotation of the water, when viewed from above as indicated in Fig. 3, and thus creates eddy currents and turbulence in the water. The water flowing over the higher edges of wall 16 increases such turbulence by falling onto the counter-clockwise moving currents. The water containing these eddy currents and this turbulence then passes through the turbulence chamber 19 and into waterway 10 with continued sealing of the outlet from the turbulence chamber being maintained with consequent maintenance of the siphon effect throughout the time water is flowing through jet 14.

It will be understood that because of the eddy currents and turbulence which is created in chamber 17 and also in the lower portion of chamber 18 and in chamber 19, the rate of outflow of water is greatly reduced and as a result the siphon effect may be maintained even though the passages in the trap are larger in cross-sectional area than has been possible heretofore.

Figs. 5 to 7 show a reverse trap type of water closet bowl which embodies a modification of the present invention. The illustrated bowl has a rectangular foot 30 having a laterally sloping surface portion 31 and having a horn or water outlet opening 52. Rear end wall 33 and side walls 34a extend upwardly from foot 30 and define a tubular space therewithin. These walls are attached to a hollow perforate rim 35 at their upper ends and walls 34a are attached at their edges to side walls 34 of the bowl. Rim 35 communicates with an opening 36 through which water may enter from a tank or flush valve (not shown). A wall 40 extends downwardly and horizontally from the front wall of the bowl rearwardly between side walls 34 and is provided with a jet opening 41. This wall 40 constitutes the

bottom wall of water-retaining chamber **42** and the upper wall of waterway **43** and chamber **43a**, the waterway **43** having opening **41** as an outlet. A slab **44** extends into chamber **42** and defines with wall **40** an outlet **45** from chamber **42**.

At its rear end wall **40** joins a vertical well **46** which extends across space **47** defined by walls **33** and **34a** at an acute angle to the longitudinal central plane of the bowl. This wall **46** has a top edge which inclines downwardly and forwardly toward the bowl and has a bottom edge above the laterally sloping bottom wall portion **31**. Wall **46** divides space **47** into two passages **48** and **49**, the former communicating through inlet **45** with chamber **42** and the latter communicating with a turbulence chamber **50** having inclined wall **31** as a floor and opening into waterway **43a** which has the outlet **52**.

A passage **55** is formed in one wall **34** and leads from chamber **56**, into which water flows from the tank or flush valve (not shown) through opening **36**, to the waterway **43**. Water flowing from the tank through passage **55** into waterway **43** will flow through jet opening **41** into water-retaining chamber **42** and thence through outlet **45** into passage **48** of the trap.

The operation of the apparatus shown in Figs. 5 to 7, inclusive, is quite like that described in some detail in connection with Figs. 1 to 4, inclusive, and repetition of that description is believed to be unnecessary.

Having thus described the present invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. A water closet comprising a foot, a bowl above and connected to said foot and a trap, said trap including substantially vertical end and side walls rising from the foot and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending across said space at an acute angle to said central plane and dividing said space into two passages of substantially equal horizontal cross-sectional area.

2. A water closet comprising a foot having a laterally inclined top surface, a bowl above and connected to said foot and a trap, said trap including substantially vertical end and side walls rising from the foot about said inclined surface and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending across said space at an acute angle to said central plane and dividing said space into two passages of substantially equal horizontal cross-sectional area.

3. A water closet comprising a foot, a bowl above and connected to said foot and a trap, said trap including substantially vertical end and side walls rising from the foot and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, a substantially horizontal cross wall extending into said space, and a substantially vertical dividing wall extending upwardly from said cross wall across said space at an acute angle to said central plane and dividing said space into two substantially triangular passages of substantially equal horizontal cross-sectional area.

4. A water closet comprising a foot having a laterally inclined top surface, a bowl above and connected to said foot and a trap, said trap including substantially vertical end and side walls rising from the foot about said inclined top surface and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, a substantially horizontal cross wall extending into said space and a substantially vertical dividing wall extending upwardly from said cross wall across said space at an acute angle to said central plane and dividing said space into two passages of substantially equal horizontal cross-sectional area.

5. A water closet comprising a foot, a bowl above and connected to said foot and a trap, said trap including substantially vertical end and side walls rising from the foot and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending across said space at an acute angle to said central plane and dividing said space into two passages of substantially equal horizontal cross-sectional area, said dividing wall having a top edge inclined downwardly toward said bowl.

6. A water closet comprising a foot having a laterally inclined top surface, a bowl above and connected to said foot and a trap, said trap including substantially vertical end and side walls rising from the foot and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending across said space at an acute angle to said central plane and dividing said space into two passages of substantially equal horizontal cross-sectional area, said dividing wall having a top edge inclined downwardly toward said bowl, and a substantially horizontal bottom edge disposed above said laterally inclined top surface of the foot.

7. A water closet comprising a foot, a bowl above and connected to said foot and having a water-retaining chamber and a waterway therebelow, and a trap, said trap including substantially vertical end and side walls rising from the foot and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending across said space at an acute angle to said central plane and dividing said space into two substantially triangular passages having long and short axes and substantially equal horizontal cross-sectional area, the top edge of said dividing wall being inclined downwardly with its lowest elevation being near one end thereof, the top surface of the foot within said tubular space being inclined downwardly and laterally from a place vertically below the lowest part of said top edge of the dividing wall.

8. A water closet comprising a foot, a bowl above and connected to said foot and having a water-retaining chamber and a waterway therebelow, and a trap, said trap including substantially vertical end and side walls rising from the foot and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending across said space at an acute angle to said central plane and dividing said space into two substantially triangular passages having long and short axes and substantially equal horizontal cross-sectional area, the top edge of said dividing wall being inclined downwardly from its outer end to its end adja-

cent to said bowl, the top surface of the foot within said tubular space sloping downwardly and laterally from a place vertically below the lower end of said top edge of the dividing wall.

9. A water closet comprising a foot, a bowl above and connected to said foot, a cross wall defining a water-retaining chamber in said bowl and a waterway therebeneath and a turbulence chamber connected to said waterway, and a trap, said trap including substantially vertical end and side walls rising from the foot about said laterally inclined surface and merging into the bowl and defining a tubular space at one end of the longitudinal central plane of said bowl, and a substantially vertical dividing wall extending upwardly from said cross wall and across said tubular space at an acute angle to said central plane and dividing said space into two substantially triangular passages of substantially equal horizontal cross-sectional area, said dividing wall having a substantially horizontal bottom edge and a top edge inclined downwardly to its lowest elevation at the end adjacent to said water-retaining chamber, the top surface of said foot being inclined downwardly and laterally with its highest portion verticaly beneath the lowest elevation of said top edge of the dividing wall to receive water flowing over the dividing wall and directed along the adjacent vertical side and end walls defining the tubular space and into the turbulence chamber.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
502,452	Wells	Aug. 1, 1893
929,786	Plantier	Aug. 3, 1909

FOREIGN PATENTS

Number	Country	Date
5,171	Great Britain	Mar. 12, 1895