

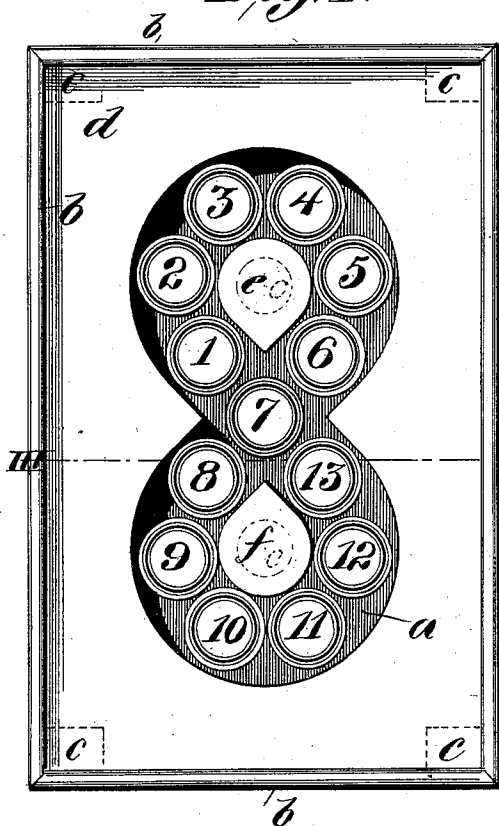
(No Model.)

A. H. JONES.  
TOY PUZZLE.

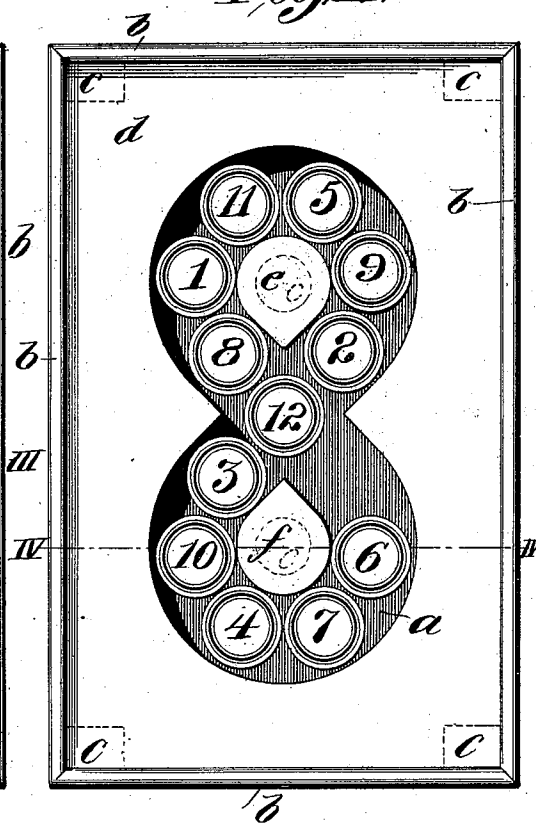
No. 563,968.

Patented July 14, 1896.

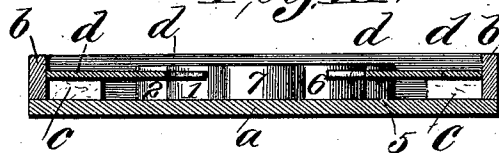
*Fig. I.*



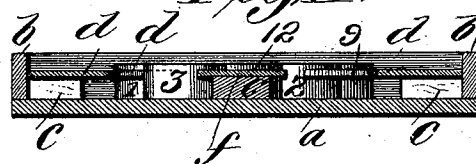
*Fig. II.*



*Fig. III.*



*Fig. IV.*



*Attest:*

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# UNITED STATES PATENT OFFICE.

ALFRED H. JONES, OF ST. LOUIS, MISSOURI.

## TOY PUZZLE.

SPECIFICATION forming part of Letters Patent No. 563,968, dated July 14, 1896.

Application filed December 4, 1893. Serial No. 492,774. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED H. JONES, a citizen of the United States, residing in the city of St. Louis, in the State of Missouri, have  
5 invented a certain new and useful Toy Puzzle, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being  
10 had to the accompanying drawings, forming part of this specification.

The object of my invention is to provide a peculiarly-shaped system of passage-ways with a plurality of movable particles placed  
15 therein and having a limited play, so that they may, by manipulation according to fixed rules hereinafter fully explained, be made to change their position relative to each other, whereby the person manipulating said movable  
20 particles with a view to arranging them in some predetermined order is given an opportunity to exercise or display both the ingenuity of his mind and the deftness of his hand for purposes of pastime and amusement.  
25

The invention will be best understood by referring to the accompanying drawings, illustrating a preferred form of the device.

Figure I is a top or plan view of one of my  
30 toy puzzles having thirteen movable particles or checkers numbered consecutively from "1" to "13" and arranged in regular succession according to their said numbers. Fig. II is a similar view showing the device with only  
35 twelve checkers numbered from "1" to "12" but placed at random in the box, without regard to the distinguishing numbers on the individual checkers. Fig. III is a transverse vertical sectional view on the plane of line III-III  
40 of Fig. I. Fig. IV is a similar sectional view of the device taken on the plane of line IV-IV of Fig. II.

Like letters of reference indicate like parts throughout the several views of the drawings.  
45 *a* is the bottom and *b b*, &c., are the sides of a shallow rectangular box, made preferably of cardboard. Running, say, midway between the top and bottom of this box, and supported, for example, on little blocks *c c c*,  
50 &c., is a false bottom, from which there is cut away and removed a portion substantially in the form of a figure eight, (8,) leaving the

three portions *d*, *e*, and *f* of the false bottom suitably supported by said blocks *c c*, &c., as  
aforesaid. The parts aforesaid may be suitably fastened together by glue, mucilage, or  
55 tacks.

The movable pieces or checkers are placed in the passage-way formed by so cutting away portions of said false bottom, and have upon  
60 them certain marks to identify them and distinguish them one from another, said marks consisting, preferably, of consecutive Arabian numerals stamped or otherwise affixed to the upper surface of the respective checkers. It  
65 will be seen that the space in which the checkers may be moved about is made up substantially of two annular passages, one surrounding the portion *e* and the other surrounding the portion *f* of the false bottom, the said  
70 annular passages being of a width slightly greater than the diameter of one of the checkers, and communicating with each other by an opening of sufficient width to permit one  
75 of the checkers to pass over from either branch or side of the one annulus into either branch or side of the other. No portion of the passage-ways, however, is of sufficient width to permit two adjoining checkers to  
80 reciprocally interchange their positions one with the other by directly passing each other. Such an interchanging of position can therefore be effected only by manipulating the  
85 checkers back and forth from one annulus to the other.

I prefer to use an even number of checkers—say twelve—and to have the two annuli of the same size. This form of the device is shown in Fig. II; but the number of checkers and the relative size of the two annuli may be  
90 varied without departing from the spirit of the invention.

When a checker occupies substantially the position of the checker 12 in Fig. II, it may be said to occupy a "dual" position—that is,  
95 it is as much in one annulus as in the other. For the sake of brevity I shall call such checker while in that position the "dual 12" or "dual 5," or whatever its number may happen to be. The play or vacant space in  
100 the passage-ways must be at least of sufficient extent to permit all the checkers in one annulus, including the "dual checker," to be freely rotated in said annulus about the por-

tion of the false bottom which said annulus surrounds without removing any of the checkers from the other annulus. It is clear that if the play is less than this no change  
 5 whatever in the relative position of the checkers can be effected without lifting them out of the passage-way.

My invention is practiced as follows: The checkers are first arranged in the box in some  
 10 predetermined order, say in the succession of their numbers, as shown in Fig. I. They are then moved about in the passage-ways promiscuously until they occupy some such position as that shown in Fig. II. The point  
 15 in the play then is to rearrange them in the predetermined order aforesaid without lifting or removing any of them from the passage-ways.

It is evident that by retracing successively  
 20 the moves or steps which were taken in disarranging the checkers the said checkers may be restored to their original positions, but it will often require great ingenuity to discover the moves necessary to so restore them, and there  
 25 will usually be many ways of restoring the checkers to said position, some of them very prolix and complicated, others more simple and direct.

A few general principles or rules of general  
 30 application to all forms of my device are here given.

Into whatever confusion the checkers may have been brought by moving them about as aforesaid, it will always be easy to bring into  
 35 each annulus the same number of checkers that will be contained therein when all the checkers shall have been restored to the desired predetermined (normal) position, (which may be any given arrangement arbitrarily  
 40 chosen.) This done, each annulus must contain an equal number of checkers normally belonging into the other annulus, for if either more or less checkers had strayed from those surrounding the core *e* (which I shall call the  
 45 upper group) into the annulus surrounding core *f* (which I shall call the lower annulus) than had strayed from the lower into the upper annulus, then it would be impossible for these annuli to contain the same number  
 50 of checkers as when all the checkers are in the normal position.

I shall now give a method of bringing alternately any given checker from the upper into the lower, and then any other given checker  
 55 from the lower into the upper annulus, whereby, by repeating the process, any given number of checkers may be brought from the upper into the lower annulus in exchange for an equal number brought from the lower into  
 60 the upper annulus. In view of what was said above, it follows that by this method all the checkers may be restored to the annuli into which they normally belong, although when so restored they may still not be in their  
 65 proper places relative to each other. Said method is as follows:

Suppose (Fig. I) that checker 4 is to be

brought from the upper to the lower and checker 10 from the lower to the upper annulus. Rotate the upper group of checkers (in-  
 70 cluding dual 7) about core *e* until checker 4 becomes dual. Then rotate the lower group (including dual 4) until checker 10 becomes dual. Then rotate the upper group till checker 7 again becomes dual. All the  
 75 checkers will then be in the same annuli respectively in which they were at the start, except that the checker 4 has passed from the upper into the lower and the checker 10 has passed from the lower into the upper annulus.  
 80 This operation, of course, can be performed *mutatis mutandis* between any two checkers in opposite annuli, and may be termed "Rule I."

When, by repeated applications of the above method or rule, all the checkers have  
 85 been restored to the annuli to which they normally belong, it yet remains to properly rearrange in their normal relative positions the checkers in each individual annulus. This may be done by the following method, which  
 90 may be termed "Rule II:" First rotate that group which contains the checker which is to be normally in the dual position until it occupies the dual position. Next, the other checkers in this group may be brought one  
 95 by one into their proper position relative to this normally dual checker as follows:

Suppose, for example, (Fig. I,) it is desired to put checker 4 next to the left of checker 7, which latter we will suppose to be the normal  
 100 dual checker. Rotate the upper group until 4 becomes dual. Then move checker 4, for example, into the left-hand lobe or branch of the lower annulus, at the same time introducing the next adjoining piece 13 from the right-  
 105 hand lobe of the lower annulus into the dual position as a makeshift. Again rotate the upper group (including the makeshift 13) until the piece which is to be displaced by the checker 4 (namely, in this instance, checker 1)  
 110 becomes dual. Introduce this checker 1 into the position from which the makeshift 13 was taken, at the same time reintroducing checker 4 into the dual position, which is its desired relative position, to wit, next adjoining the  
 115 checker 7 on the left. Then put the makeshift 13 and the displaced checker 1 back into the annuli into which they normally belong by the method (Rule I) herein first described. The remaining checkers in the upper group  
 120 may then be restored one by one to their proper positions relative to the normally dual checker 7 in like manner as checker 4 by simply repeating *mutatis mutandis* the foregoing operation, which I have called "Rule  
 125 II." This done, rotate the upper group till 7 becomes dual.

Now directing our attention to the lower group, all of the checkers in that group may by the same method be put into the proper  
 130 position relative to the normally dual checker 7. This having been done, it is evident that all the checkers in each individual annulus will have been brought to their normal positions

relative to each other with only one possible exception—namely, in arranging the normally dual checker 7 with relation to the checkers in the lower group it may have become misplaced with reference to those in the upper group. Thus, for example, instead of the succession 1, 2, 3, 4, 5, 6, 7 in the upper annulus, (that being now supposed to be the normal order of the checkers,) we may have the succession 1, 2, 7, 3, 4, 5, 6, the normally dual checker 7 having got between the 2 and the 3, instead of between the 6 and the 1. Now, it will be observed that whenever two checkers in the same annulus are made to interchange their positions one with the other by the method hereinbefore set forth (Rule II) one of the checkers in the other annulus (being the one which is used as a makeshift, as above explained) will pass either from the right-hand side to the left-hand side or from the left to the right side of the dual checker; so, for example, it will be found if checker 4, Fig. 1, is made to interchange places with checker 1, so as to come next to the left of checker 7, and if checker 13 is used as "makeshift," all precisely as above described (operation called "Rule II,") then at the end of the operation it will be found that said checker 13 has been shifted from the right to the left side of the dual checker 7. Thus in the case above supposed, where the 1 and 2 have got on the wrong side of the dual 7, if, for example, the 8 and 9 are made to mutually interchange their position twice, (with the result that both again return to their original relative positions,) then if the checkers 1 and 2 are, in effecting these two interchanges, successively employed as the makeshifts, they will be made to pass to the other side of dual 7, and all the checkers will thus be brought to their normal positions. This constitutes Rule III.

The foregoing principles or rules will suffice to solve the puzzle in any form and with the minimum amount of play between the checkers that will admit them to be rotated about the core of one annulus without removing any of the checkers from the other annulus. If the play between the checkers be sufficiently increased, it is evident that maneuvers may be performed which would be impossible if the play between the checkers were very slight. Suppose, for example, that in the form of device shown in the drawings the number of checkers be diminished to twelve. If these are in the position shown in Fig. II, the 5 and 12 may be made to interchange positions with each other without destroying the arrangement of the other checkers as follows:

Move dual 12, Fig. II, into the vacant space between it and checker 6. Then rotate the six checkers remaining in the upper annulus in the direction of the hands of a watch until 5 becomes dual. Then move the dual 5 into the left lobe of the lower annulus, at the same time restoring checker 12 to the dual position.

Then again rotate the upper group of checkers till checker 8 is just to the left of the space where a checker is dual, leaving said space clear. Then move checker 5 from the left lobe of the lower annulus into the dual position. It will be seen that all the checkers will now have been restored to the position shown in Fig. II, except that the 12 and the 5 have mutually interchanged positions, and that this has been accomplished without the use of a makeshift, (which was indispensable in the method above described for effecting such an interchange of position between two checkers of the same group when the play is more limited, so that one checker cannot be removed from the dual position without forcing another partially or entirely into said position.) The principles herein first set forth, however, will still apply when larger play is so given the checkers, although they may in such case be supplemented by others resting on the particular form of the device.

Having fully described my invention, what I wish to claim, and secure by Letters Patent of the United States, is—

1. A toy puzzle consisting of two continuous annular passage-ways communicating with each other by only a single port and a plurality of movable pieces, bearing earmarks or marks of identification, contained in said passage-ways and having a limited play therein less than the space occupied by two of the movable pieces, whereby said movable pieces are adapted to be manipulated in said passage-ways according to fixed rules as described.

2. A toy puzzle consisting of two continuous annular passage-ways communicating with each other by only a single port and a plurality of movable pieces, bearing earmarks or marks of identification, contained in said passage-ways and having a limited play therein, said play being so slight that the port of communication between the two passage-ways is always partially or entirely blocked by the movable pieces, whereby said movable pieces are adapted to be manipulated in said passage-ways according to fixed rules as described.

3. A toy puzzle consisting of two equal continuous annular passage-ways, communicating with each other by only a single port, and an odd number of movable pieces bearing earmarks, arranged within said passage-ways having very limited play therein, whereby said movable pieces are adapted to be manipulated in said passage-ways according to fixed rules as set forth.

In testimony whereof I have hereunto set my hand and affixed my seal, this 27th day of November, A. D. 1893, in presence of two subscribing witnesses.

ALFRED H. JONES. [L. S.]

Witnesses:

JOSEPH G. HOLLIDAY,  
GEORGE L. NEUHOFF.