

J. L. BROWN.
SPINNING TOP.

No. 501,321.

Patented July 11, 1893.

Fig. 1.

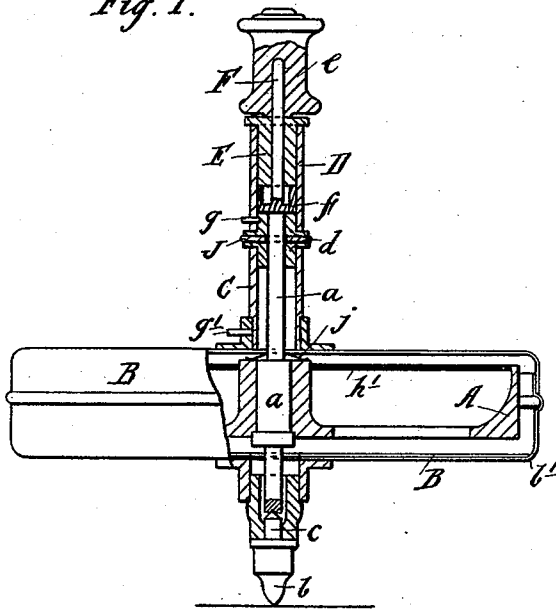


Fig. 2.

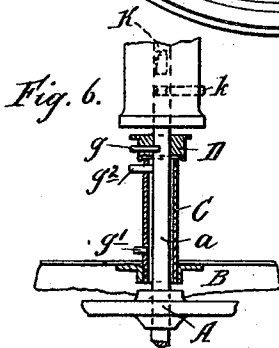
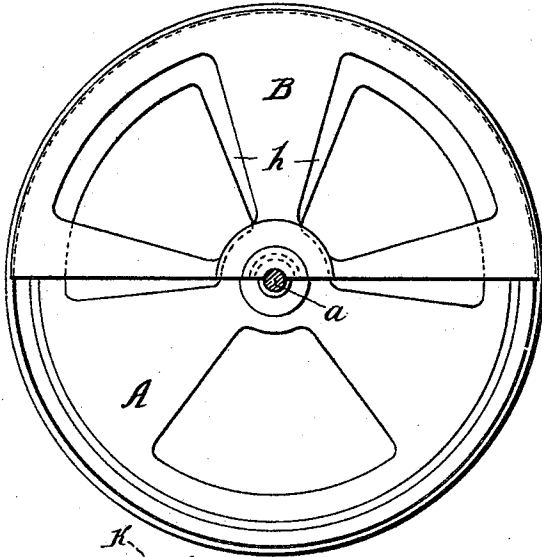


Fig. 7.

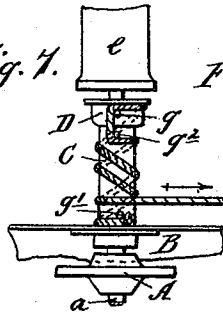


Fig. 8.

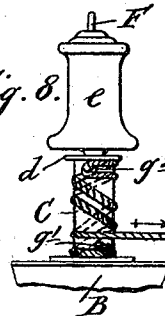


Fig. 3.

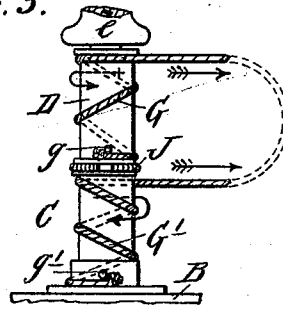


Fig. 4.

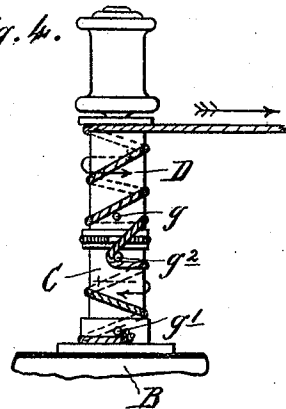
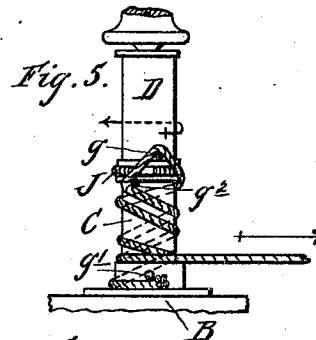


Fig. 5.



Witnesses:

Wm. Dick
L. C. Hills

Inventor:

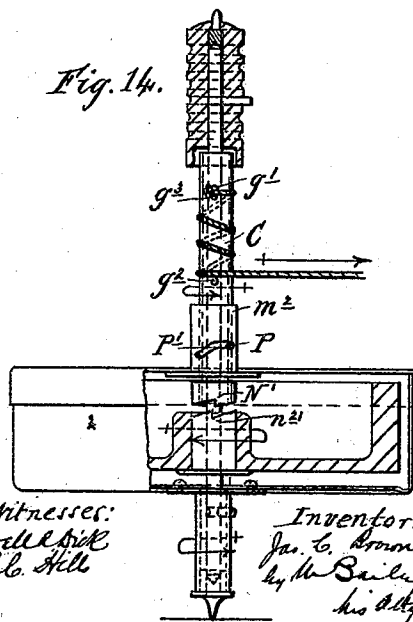
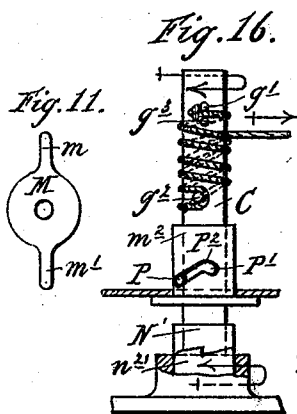
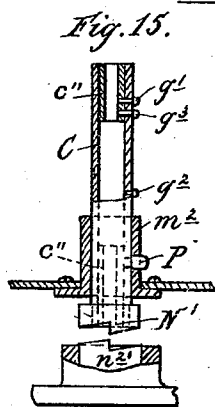
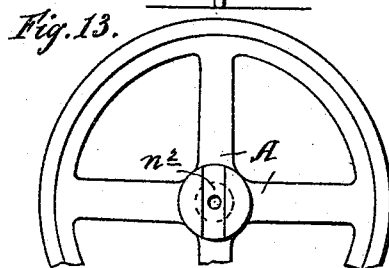
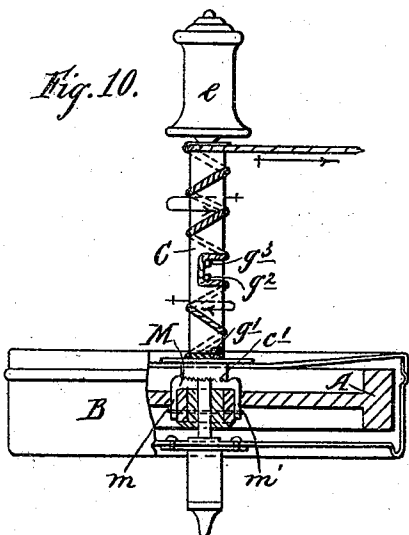
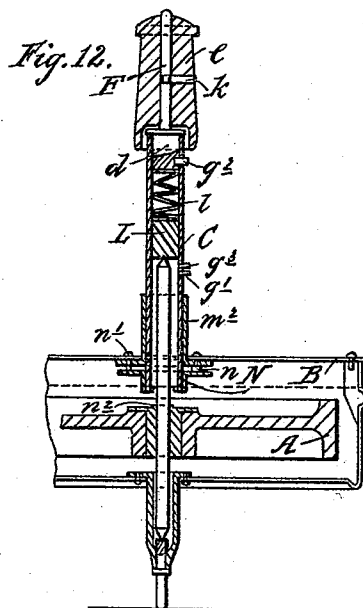
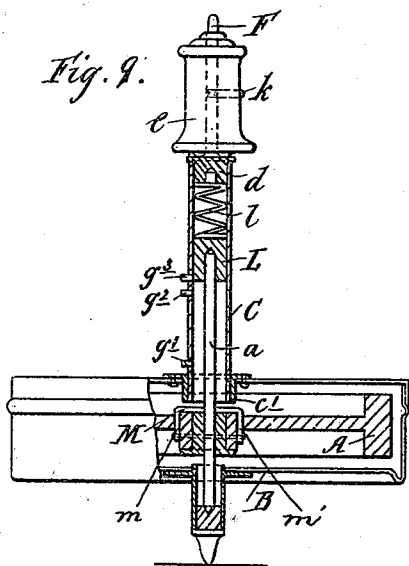
Jas L. Brown

by Marshall Bailey
his attorney.

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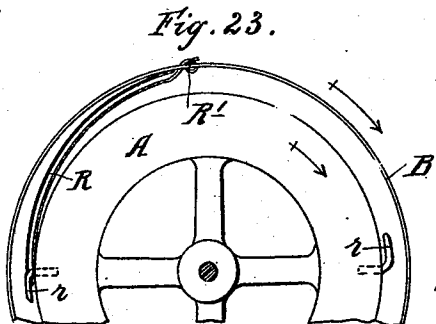
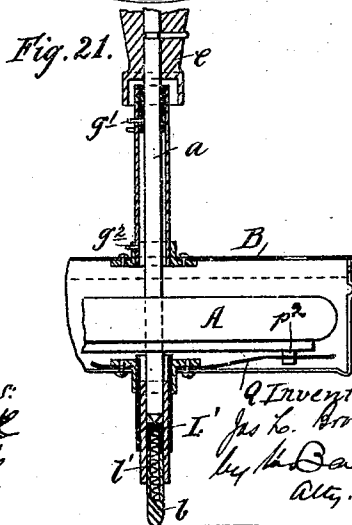
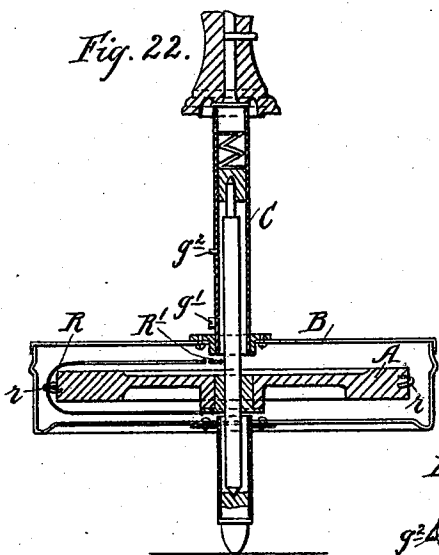
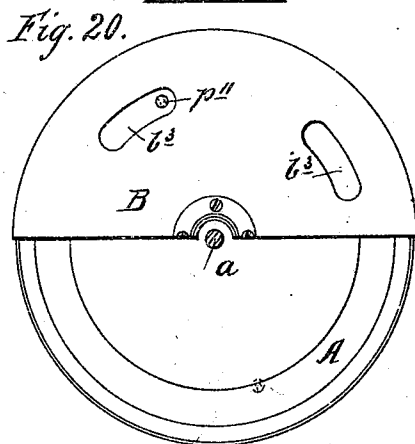
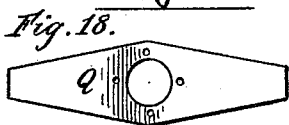
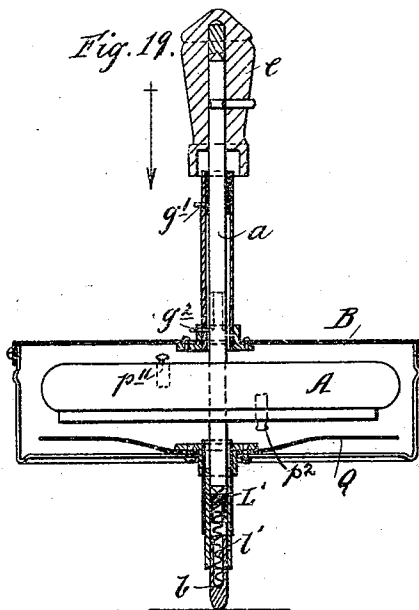
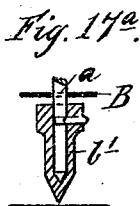
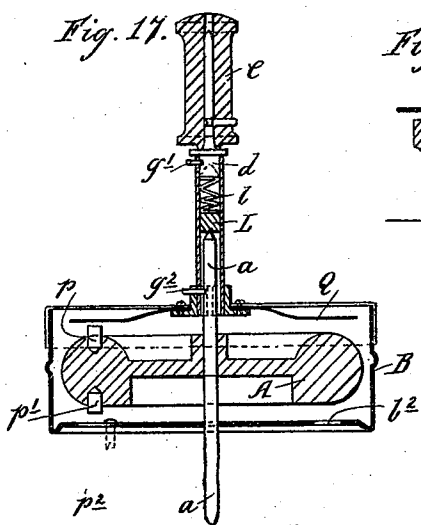
Witnesses:
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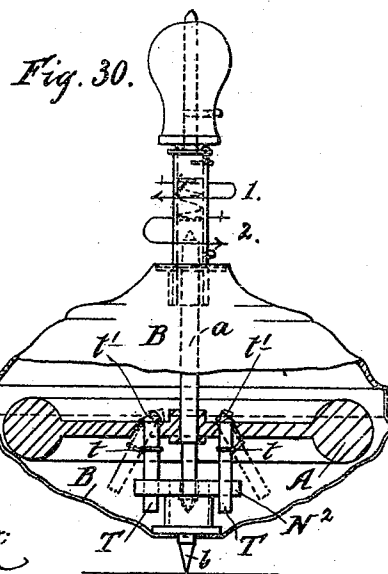
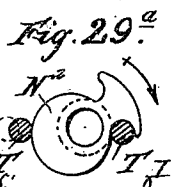
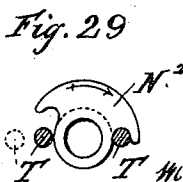
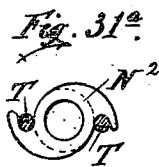
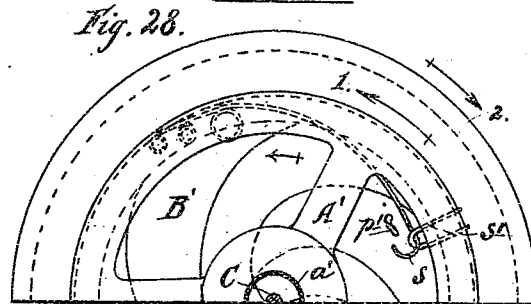
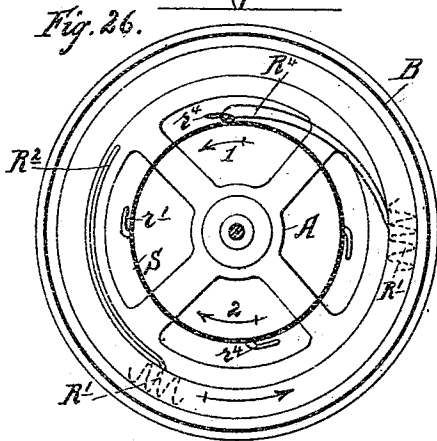
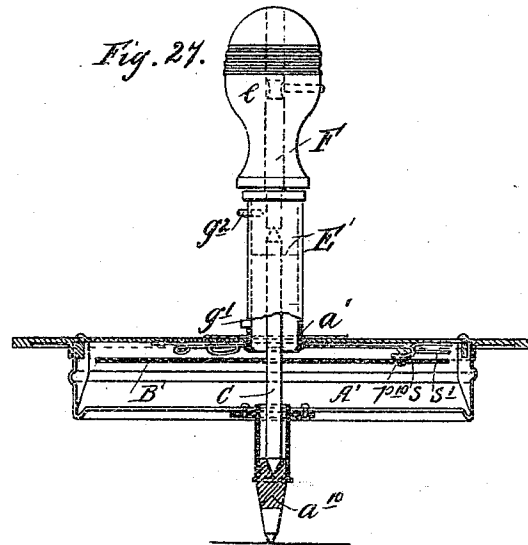
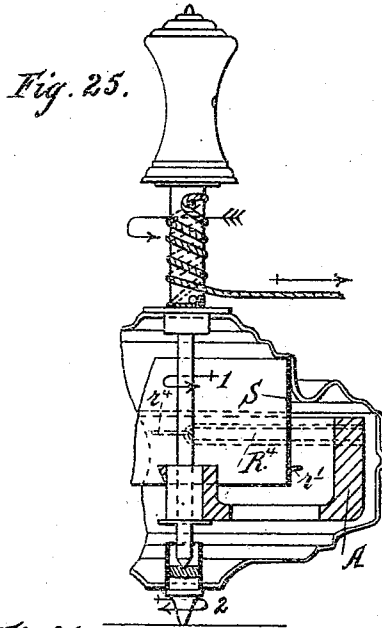
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Patented July 11, 1893.



Witness:
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(No Model.)

6 Sheets—Sheet 6.

J. L. BROWN.
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Fig. 38.

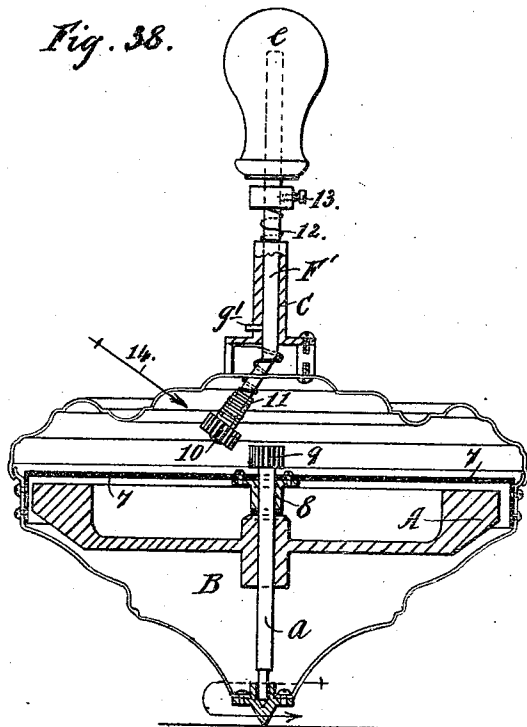


Fig. 38^a.

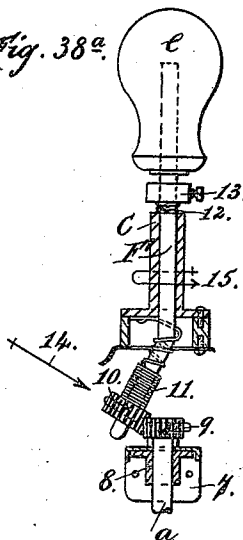


Fig. 38^b.

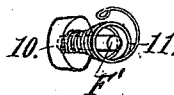
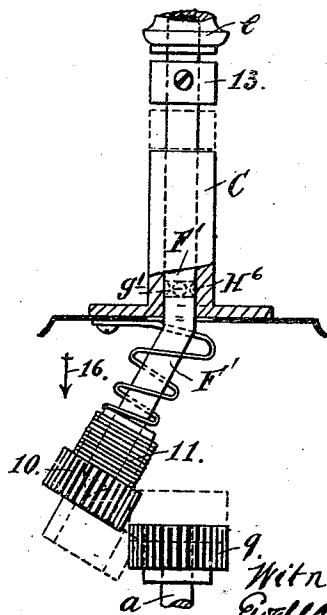
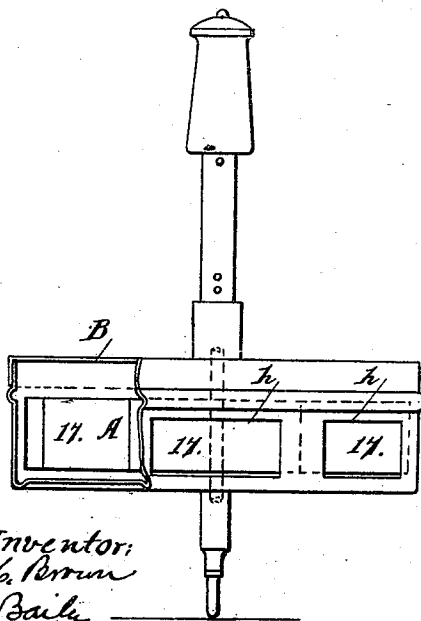


Fig. 39.



Witnesses:
E. L. Kiddle
L. L. Kiddle

Fig. 40.



Inventor:
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UNITED STATES PATENT OFFICE.

JAMES LOCKHART BROWN, OF GLASGOW, SCOTLAND.

SPINNING-TOP.

SPECIFICATION forming part of Letters Patent No. 501,321, dated July 11, 1893.

Application filed May 21, 1892. Serial No. 433,873. (No model.)

To all whom it may concern:

Be it known that I, JAMES LOCKHART BROWN, draftsman, of 14 Cathedral Street, Glasgow, in the county of Lanark, Scotland, have invented Improvements in Spinning-Tops, of which the following is a specification.

This invention which relates to improvements in spinning tops has for its chief object the production of tops whose special features of novelty are that besides being capable of spinning in one direction with a speed continually lessened, as a common top spins, they are in addition through the operation of my improvements capable of being spun so as not only to remain upright instead of falling down when that spinning is about to cease, and also when it has stopped, but also to have their spinning immediately thereafter renewed and for some time accelerated in the opposite direction to that in which they spun previous to the aforesaid stopping.

In carrying out my said invention I employ a fly wheel, or I employ as a fly wheel a heavy rimmed solid or hollow top, and in the simplest form which my improvements take, I combine this fly wheel or heavy rimmed top with a light hollow or solid top as hereinafter described and illustrated by the drawings annexed, in such a way that each of the two can be left spinning oppositely to the other by the pulling off of a cord suitably wound about the stem, and can thereafter spin independently each of the other save for friction.

In the drawings—Figures 1 to 5 inclusive illustrate the simplest way in which I carry out my improvements, and of these Figs. 1 and 2 are sectional elevation and plan respectively showing the combination of the fly wheel and light top, and Figs. 3, 4 and 5 are part elevations showing various methods of winding the spinning cord. Fig. 6 is a sectional elevation of a modification of the stem and holder-knob, and Fig. 7 is an elevation of same, showing the method of leading the cord in winding. Fig. 8 is an elevation showing a further modification of the holder and stem and the winding of the cord. Figs. 9 and 10 are sectional elevations showing a modification whereby the fly and its spindle are contained entirely within the light top, and Fig. 11 is a plan of a detail of same. Fig. 12 is a sectional elevation of

a modification of the arrangement shown in Figs. 9 and 10, and Fig. 13 is a plan of the fly of Fig. 12. Fig. 14 is a sectional elevation showing a modification of the arrangement illustrated by Figs. 12 and 13 whereby spinning is more easily accomplished. Fig. 15 is a part sectional elevation of the stem of Fig. 14. Fig. 16 is an elevation of the same showing the winding and the position of the parts at beginning of the pull of the cord. Fig. 17 is a part sectional elevation showing a further method of effecting connection and disconnection of the fly and light top, and Fig. 17^a is a sectional elevation of a loose pivot. Fig. 18 is a plan of a detail of Fig. 17. Figs. 19 and 20 are a sectional elevation and plan of another method of connection and disconnection. Fig. 21 is a part sectional elevation of Fig. 19. Figs. 22 and 23 are sectional elevation and plan showing a method of connection by hook and loop, and Fig. 24 is a sectional plan showing a detail thereof. Figs. 25 and 26 are part sectional elevation and sectional plan showing a modification of hook and loop connection. Figs. 27 and 28 are sectional elevation and part plan showing my improvements applied to a light solid top. Fig. 30 is a sectional elevation showing a method of connecting the light top and fly by pendulum arms and clutch, and Figs. 29, 29^a, and 31 and 31^a, plans of various forms of clutch for same. Fig. 32 is a sectional elevation showing another method of connecting and disconnecting the fly and light top. Fig. 33 is a plan of same with the cover off, and Fig. 34 is a sectional plan of a detail. Fig. 35 is an elevation of the stem of same, showing the winding for one of the methods of connection. Figs. 36, 36^a, and 36^b are sectional detail plans elucidating the action of the cord when wound as in Fig. 35. Fig. 37 is a part sectional elevation of a modification whereby reverse winding of the spinning cord is dispensed with. Fig. 37^a is a sectional edge view of the upper part, and Figs. 37^b and 37^c are plans of details of same. Fig. 38 is a sectional elevation showing out of gear another arrangement for utilizing ordinary winding. Fig. 38^a is a part sectional view of same and showing the arrangement in gear. Fig. 38^b is a plan of a detail of Fig. 38, and Fig. 39 is a part sectional elevation illustrating two

modifications of the said gearing. Fig. 40 is a part sectional elevation of a modification in which optical illusions and chromatic effects are produced.

5 In all the drawings the same reference letters and figures denote the same parts.

Referring to Figs. 1 to 5 inclusive I employ a fly wheel A, and I mount this fly wheel on a spindle *a* having a female or a male center at its lower end, and I combine this fly wheel with a light hollow top B made in two or more parts joined as shown or otherwise. I provide the said light top B with a pivot *b* carrying a male or female center *c* and also with a tubular winding stem C having a drilled and flanged plug *d* in its upper end as a bearing for spindle *a*. Onto that end of the fly spindle *a* which projects beyond *d*, I mount another winding stem D which I plug at its upper end with a drilled plug E. I also provide a holder knob or handle *e* having a pin F forced into it, and which works easily in the handle *e* and has a tight collar *f* formed or fixed on its lower end. The fly spindle *a* works in the plug *d* and on the center *c*, and the whole combination has for its pivot the pivot *b*, so that the fly A and the light top B can be spun and can continue to spin independently each of the other save for friction.

30 In order to set the above described combination spinning so that the fly A may sustain the light top B when B's spinning has with the fly's assistance been stopped and thereafter cause it to spin oppositely to its direction of spinning previous to the said stopping, I engage (see Fig. 3), a bead or a knot on the end of a cord G with a cord detaining peg *g* fixed in the winding stem of the fly A and wind that cord say to the left as shown. I then take hold of the holder or of B and pull off the cord G, thus spinning A left handed. Immediately thereafter I engage and wind the same cord but lettered G' right handed, as shown on the stem of B, with the help of the peg *g'*, and I then allow the whole arrangement to hang by the holder or stand on the pivot *b*, and steadying it by *e* I pull off the cord G' and so leave the fly A spinning left handed within the light top B, and B spinning right handed upon the pivot *b*, each at about the same speed. When the fly A and the light top B are thus left spinning oppositely to each other then the fly A on account of its superior weight, and therefore greater stored up energy does by means of its pivot friction at *c*, and its axle friction at *d*, and by means of the friction due to the air inclosed or passing between itself and the light top assist the friction of the pivot *b*, and the friction of the air around the light top B in slowing the right handed spinning of the said light top B, until that right handed spinning is by these means stopped, after which the fly A still rapidly spinning left handed does by its pivot and axle friction, and by the friction of the air between itself and B cause B to begin spinning in the same direction as itself, that

is, for the present description, left handed, and does accelerate B's spinning in that direction for some time, all of which is done without any danger of the light top falling down, since it is sustained by the spindle *a* of the fly A which fly is all the while stable in the plane of its own continuous rapid spinning.

75 In order that optical illusions and chromatic effects may be produced while the above described performance is proceeding, I cut one or more openings *h* in the upper side of B, and I paint any suitable device or arrangement of colors on the upper side of the fly A, or I mount thereon a colored card *h'* which may be changed at will. I paint the upper surface of B in this case preferably black, and I apply the color more widely and deeply as I approach the circumference of the card. While A and B are spinning at different speeds in the same direction, or at the same or different speeds in opposite directions, then the colored device or varied coloring on the fly A or on the card *h'* on the fly A, appears through the revolving opening or openings *h* of the top B in such a way as to produce in some cases apparent change of color of the top or chromatic effect and in some cases apparent change of device or apparent repeated and capricious reversal or standing still of the top which is optical illusion. I may also place the colored card in the bottom of B so that it can appear through one or more openings in the fly A and light top B. Instead of winding as hereinbefore described, I may wind the cord G' as before mentioned on C (see Fig. 3), and another cord G on D contrary to the cord G' and spin by pulling both cords off at once.

100 Preferably I use one cord alone and wind the two parts or ends as in Fig. 3, and spin according to the arrows by pulling off that cord by the bend or bight, shown in dotted lines.

As a modification of the method of winding two parts of the same cord in contrary directions I may wind as shown in Fig. 4, when I fix another peg *g*² (which I call a cord reversing peg) in C as shown. I then engage the knot on the cord as shown with peg *g'* in Fig. 4 and wind a part of the cord say right handed till I reach peg *g*². I then turn the cord half way around *g*² and keeping it tight I proceed to wind another part of the cord left handed around D neglecting the peg *g* in D thus obtaining an easier method of winding. When the cord as thus wound is pulled per the straight arrow, the former part of it coiled about D spins both the fly A and the light top B as per the curved arrow, until or nearly until the cord reversing peg *g*² is reached. Then the cord slips from off that said peg *g*² and the latter part of the cord coiled about C spins the light top B alone oppositely to the now freely spinning fly A so that after the cord is all pulled off, the fly A and the light top B, are left spinning op-

positely and independently of each other save for friction.

As another modification than that last described I proceed as shown in Fig. 5, so that instead of the cord on the stem D of the fly A dragging around the light top during the former part of the pull off, the cord on the stem C of the light top B drags the fly A around during that part of the pull off, thus making it possible to dispense with a great part of the stem D above the peg *g* as shown in Figs. 6 and 7 to be hereinafter described.

In Fig. 5 the cord is shown engaged with the peg *g'* and a part is wound right handed till the peg *g²* is reached. The peg *g* is then brought above the peg *g²* and the cord is strained tight over both pegs as shown, and then after being brought down below *g²*, again another part is wound left handed over the part already wound right handed on C. The straining of the cord over the pegs *g* and *g²* effects a temporary connection between the fly A and the light top B. When the cord thus wound is pulled as per the straight arrow, the light top B drags the fly around as per the curved arrow, until or nearly until the peg *g* is reached, immediately after which the cord slips from both pegs and the remaining and reverse wound part of the cord then spins the light top B alone oppositely to the spinning of the fly A, so that the fly A and the light top B are left spinning as before described in opposite directions. It remains to be mentioned that in Figs. 1, 3, 4 and 5 J is a loose slightly projecting washer between D and C to prevent the cord from falling or being dragged into the gap between D and C. Also in Fig. 1 *j* is a loose washer to minimize the end play of the fly spindle *a* so that if the top be spun while hanging from the hand by the holder, the joint at J shall not open so as to let the cord slip into it. In order to obtain a shorter winding stem so that the top may spin more steadily I cut down the stem D of Fig. 5 until it remains as a mere collar carrying a peg as shown in Figs. 6 and 7, where D is the said remaining collar and *g* is the cord reversing peg which it carries. The said collar D is telescoped over the end of the stem C to prevent jamming of the cord and flanged above to prevent the cord from being dragged into the gap between itself and the holder *e*, which is mounted loosely on the projecting end of the fly spindle *a*, and furnished with a female center K let into it and in which runs a male center formed on the upper end of *a*, so as to diminish friction on the pin *k* if the top be held down while the cord is being pulled. The pin *k* inserted through the holder has its point engaged in a groove in the spindle *a* in order that the top may be spun while hanging from the hand by the holder *e*. The collar D is fixed to the spindle *a* so as to drive it around and the remaining parts are substantially the same as in Fig. 1. Fig. 7 shows the leading of the cord when winding and the method and its

results are the same as described for Fig. 5. In order still more to shorten the winding stem with the object before mentioned, I may employ the further modifications of winding stem shown in Fig. 8 by adopting which I dispense with the peg *g* and collar D of Figs. 6 and 7. The internal parts not shown in Fig. 8, are shown in Fig. 9 in this modification. I place the spindle *a* of the fly A entirely within the winding stem C of the light top B. The upper end of spindle *a* has a male center formed on it and works in a drilled and female centered plunger L, sliding freely inside of C, which is plugged at its upper end with a flanged plug *g* having formed on it or fixed to it the holder pin F. Between *d* and L is interposed a spiral spring *l* strong enough to prevent end shake of spindle *a*, without creating such friction at the upper and lower centers of *a* as to interfere with the independent contrary spinning of A and B after the cord has been pulled off. I make the holder pin F project through the holder *e* and allow the holder *e* to rest on the plug *d* and retain it on the pin F by the pin *k*. In Fig. 8, only the pegs *g'* and *g²* are required, and one part of the cord is wound from *g'* in one direction up to *g²*. It is then turned half around *g²* and another part wound oppositely down the stem C again as shown. When the stem is long as shown in Fig. 9, then in addition to the pegs *g'* and *g²*, I place another peg *g³* near *g²* so that the cord knot, may, if preferred, be engaged by *g³* and *g²*. Or the cord may be reversed over *g'* and *g²* as shown. In order that the greatly shortened stem obtained by the modification shown in Fig. 8 may be used, I provide means whereby the light top and the fly can be connected and disconnected at the proper moment while pulling the cord, and Figs. 9 and 10 illustrate this said means, in carrying out which I make the roof of the light top B to be elastic so that it can be deflected by pressure on the holder *e*, as shown in Fig. 10, until the serrated annular face *c'* at the lower end of the light top's spindle C, indents and grips an india rubber or other suitable washer M made fast to the fly A. When this is done and the cord is wound either as per Fig. 8 or Fig. 10, and pulled as per straight arrow, then pressure on the holder *e* being maintained, the light top B drags around the fly A as per curved arrow. This pressure being smartly relaxed, as by lifting the top when the cord is seen to be near the reversing peg or pegs, the result is that the top B is disconnected from the fly A and left free to be reversely spun independently of it, as per curved arrow, by the remaining part of the cord.

Fig. 11 shows the washer M in detail having arms *m* and *m'*, which are bent down between the arms of the fly A as clearly shown in Figs. 9 and 10, and thereafter bound to the hub of the fly A below the arms by strong thread or thin wire, in addition to which I may use any suitable cement. The remainder

of Figs. 9 and 10 are substantially the same as parts already described. Instead of the serrated lower end of C and the washer M, I may employ a pin clutch or a grooved and

5 tongued clutch such as are shown in Fig. 12. Figs. 12 and 13 show a modification of the method of connecting and disconnecting which has for its object to obviate the necessity of making the roof of B, elastic, and so
10 diminish the amount of pressure necessary on the holder *e*, thus producing a stiffer and stronger light top B in which the winding stem C is less likely to be bent out of true by use. In carrying out this said modification I
15 construct the light top B, with a rigid roof and I make the winding stem C tubular, and furnish it with the mountings *d*, *e*, *F*, *g'*, *g*², *k*, *L*, and *l*, the same as detailed in describing Fig. 9. But instead of fixing C rigidly to B,
20 I arrange it to slide under pressure on the holder *e* through a short flanged tube *m*² fixed to the roof of B, and I utilize the spring *l* to return C when that pressure is relaxed. On the lower end of C, I fix a short flanged or
25 lugged tubular piece N and in the flange of one or both of the lugs of N, I fix a pin or pins or a screw *n* whose head engages with the projecting tail of the pin or pins or screw *n'* in the flange of *m*². Across the lower annular
30 face of the flange piece N, I sink suitable recesses or grooves or a groove as is clearly shown in Fig. 12, and on the upper face of the hub of the fly A, I form tongues or a tongue *n*² to engage with the aforesaid
35 groove. In the stem C in addition to the peg *g'* I provide another peg *g*³ at a suitable distance from *g'*. The holder *e* is substantially the same as that in Fig. 9. The cord being engaged by means of its knot with the pegs
40 *g'* and *g*³ it is wound as in Fig. 8. Pressure being put on *e* the stem C descends until the groove in N is either in gear with the tongue *n*² or till N's descent be stopped by the tongue *n*². The cord being then pulled the piece N
45 if not yet engaged with *n*² slips around till its recesses engage with the tongue *n*² in the fly A, and at the same time the pin *n'* being out of gear with the pin *n*, the stem C by its clutch N drives around the fly A without the
50 light top B being at the same time positively dragged around. I may also adopt this arrangement when I desire to apply my improvements to a light solid top, by making the fly in the form of a heavy rimmed hollow top, and placing the light solid top
55 within it as hereinafter explained. On seeing that the cord has been pulled off to within a coil or two of the cord reversing peg *g*² the operator smartly relaxes pressure or lifts the top while still steadily pulling. By this relaxing pressure or lifting he causes the clutch N to take up the position in which it is shown in Fig. 12, and as soon as the cord has slipped from off *g*² he, by the remaining
60 and contrary coiled part of the cord spins the light top B oppositely to A. When after thus spinning the holder *e* is let go, the spring *l*

keeps the clutch N as shown in Fig. 12, and A and B are thus left spinning oppositely and independently save for friction. The other
70 parts in Fig. 12 not mentioned are the same as parts previously described. In all the arrangements as yet described I would have it understood, that the knot on the end of the cord may be placed at option at either side
75 of the peg *g'* or in this case *g*² and *g*³, so that the light top may be made to reverse either from right hand spinning to left hand, or vice versa. To obviate the necessity of the skill required to relax pressure on the holder at
80 the right moment, I modify the arrangement just described as per Figs. 14, 15 and 16. In this modification the parts *d*, *L*, *l*, *n*, and *n'* of the modification shown in Fig. 12 are not used. The fly spindle projects beyond C and
85 the holder runs loose on its projecting end as before shown in Fig. 6. The cord knot and reversing pegs are located on C inversely to those in Fig. 12. C is bushed at its ends as shown in Fig. 15 at *c''*. The clutches N'
90 and *n*²¹ are of the ordinary clawed form. A pin P in the stem C works in a slot P' formed in the sleeve *m*² in which C turns freely. In winding the cord as shown wound at Fig. 16, the top is held in the left hand and when the
95 cord is turned over cord *g*² I utilize the pull to turn the pin P toward the position it has in Fig. 16, so that on account of the form of the slot P', the clutches N' and *n*²¹ are brought into or nearly into gear. When the cord is
100 pulled to spin the top as in Fig. 16, then the clutches are put fully into gear by the pull of the cord forcing P to the position shown in Fig. 16. Immediately after the cord has slipped from the reversing pin as in Fig. 14,
105 C and its pin P are dragged around by the reverse coiled part of the cord, so that P is jerked to the position shown in Fig. 14, and on account of the form of the slot P' the stem C is thereby raised and lifts the clutch
110 N' out of gear with *n*²¹, and B is left free to be spun oppositely to A. That the friction of the fly spindle running in its bushes *c''* in C may not turn C and the pin P from its position in Fig. 14, back to its position
115 in Fig. 16, that end of the slot where the pin is shown in Fig. 14, droops suitably as clearly shown, P² being the highest part of the leading edge of the slot. The top might be damaged by being spun with wrong re-
120 verse winding of the cord. Therefore I bevel the cord reversing peg *g*² as shown in Fig. 24. And in all cases in which this peg is beveled I preferably locate it on the stem so that the knot cannot be engaged with it, as by
125 means of the said peg *g*³ and an adjacent flange (see Fig. 8) by mistake as this would defeat the object of the beveling. I may employ a claw formed clutch instead of the friction clutch in the top shown in Figs. 9 and
130 10 or in that of Fig. 12.

In any top herein described I may dispense with the lower pivot of the hollow outer top B, and I illustrate this modification by Fig.

17. In the modification now under notice I employ pressure and release of pressure on the holder. The construction of the top in Fig. 17, is the same as that in Figs. 9 and 10, only that the light top B has no lower pivot and that instead of employing a central clutch and elastic roof, I fix a pin p in the fly A and attach a flat spring Q, bent if necessary as shown in Fig. 17 to the under side of B's rigid roof and adopt preferably the short stem as in Fig. 8, but with the cord pegs inversely located, that is, the peg g' is above the peg g^2 . The spindle a of the fly A projects and works through a central hole or a bearing fixed in B's lower side. Pressure being given on the holder e the light top B descends until the spring l is fully closed, and the spring Q is in a position to engage with the pin p , though perhaps deflected at one end by p . I make p to be still clear of B's roof when l is thus fully closed. On the cord now being pulled Q slips off from p , if it has been resting thereon and drives round the fly A by p . The location given to the knot peg and cord reversing peg in this top I adopt preferably in all tops requiring pressure on the holder during a former part of the pull of the cord while spinning them, and relaxation of such pressure or lifting of the top immediately previous to the beginning of a latter part of the said pull, in order that this top and such tops may be wound so that the cord by its uncoiling can be taken to indicate to the operator that the end of the period for downward pressure has arrived. And in this top and tops requiring pressure on the holder during a former part of the pull of the cord while spinning them, and relaxation of that pressure previous to the beginning of a latter part of the said pull, I wind the cord so that it shall on being pulled to spin the top uncoil during a former part of the said pull downward of the stem, and I adopt this method of winding in the case of this top and such tops as a means of facilitating the suitable lifting up of them or relaxation of pressure as before mentioned as follows. I employ the cord to be taken to indicate to the operator by its near approach to the end of its downward uncoiling, that the end of the period for downward pressure has arrived, so that the operator may the more suddenly relax pressure by smartly lifting the top. In this case I make the pin g^2 long enough to engage in a wide groove in the fly spindle a , as indicated in Fig. 17, and so prevent the fly A from falling to the bottom of B, when B is lifted. Pressure on the holder e being relaxed the light top B is returned by the spring l to the position shown and thus left free to be spun oppositely to A. I may fit the spring Q and the peg p , in the top shown in Figs. 9 and 10, as a means of driving A, and I may attach Q to the piece N in the top shown in Fig. 12, and dispense with the grooves in N, and I may also fit pin p to the same top's fly A, and dispense with the

tongue n^2 . In the top shown in Fig. 14, I may substitute the same spring and pin for the central clutches of that top.

That I may utilize the weight of the fly in connecting B with A, I drill a hole or holes b^2 in the bottom of B suitably located for engagement with the pin p' fixed in the under side of A's rim. In this modification I place the knot peg and reversing peg as in Fig. 8, and wind as in Fig. 8, and the spring l , and plug L may be dispensed with and spindle a made longer, so as to work in the dotted female center in plug d . In spinning this top the operator lets it hang from his hand by the holder e , and I thus utilize the weight of the fly in effecting connection of B with A since the fly then falls and enables pin p' to engage one of the holes b^2 in the lower side of B. I adopt the location given to the knot peg and cord reversing peg in this top, and which may be adopted in all tops requiring to be held up during a former part of the pull of the cord while spinning them, and to be set down previous to the beginning of a latter part of said pull, in order that this top and such tops may be wound so that the cord by its uncoiling can be taken to indicate to the operator, that the end of the period for holding up the top has arrived. I wind the cord so that it shall on being pulled to spin the top, uncoil during a former part of the said pull upward of the stem, and during a latter part of said pull downward of the stem, and I adopt this method of winding in the case of this top and such tops as a means of facilitating the suitable setting down of them, as aforementioned as follows. I employ the cord as a means for indication to the operator by its near approach to the end of its upward uncoiling, that the end of the period for holding up of the top has arrived. I may furnish the lower end of spindle a , as shown in Fig. 17^a, with a loose pivot b' retained on a . The top can then be lifted by the loose pivot b' without stopping the fly A.

In carrying out my method of effecting connection by holding the top up and disconnection by setting it down, I further adopt the modification shown in Figs. 19 and 20, in which the weight of the fly is utilized to assist in effecting disconnection when the top is set down. I drill or punch a hole or holes b^3 in the roof of B, and drive pins or a pin of the form shown at p^{11} in the rim of A to engage with these holes b^3 . When the top is lifted by means of the holder e which runs loosely on the upper or projecting end of a , the light top B slides down till it stops on the pins or pin p^{11} , or till it stops on the fly A with p^{11} engaged in a hole b^3 , as shown in Fig. 20. When the top is set down near the end of the former part of the pull of the cord, no sooner has the pivot of the outer top touched the surface, whereon the top is to spin, then the weight of the fly A assists the operator in effecting the disengagement of the pin p^{11} from the hole b^3 . In this modification I prefer to

fit B with a pivot, the same as shown in Fig. 17^a. The pivot shown in Fig. 19 belongs to the next modification. I locate the knot peg as described in connection with the last modification and for the object there set forth, also I wind and employ the cord as there described.

As a modification I may dispense with any assistance from the fly's weight, and effect connection of A with B by pressing the fly A downward, as also shown by Figs. 19, 20 and 21. I fit the pivot *b* with a sufficiently stiff spring *l'*, and a plunger *L'*, and I employ pins or a pin *p*² of the form shown but fixed on the underside of A near or in its rim. I fix the spring Q to the inner surface of B's lower side. I make the pin *p*² of such a length that when the plunger *L'* is closed against the pivot *b*, as shown in Fig. 21, the pin *p*² is clear of the bottom of B and yet in a position to be driven by Q. That the top may be lifted in effecting disconnection of A and B, I may utilize the inward end of one of the cord pegs by engaging with a groove in *a* of such width that the fly can not be lifted so as to rub against B's roof. I locate the knot peg and cord reversing peg described in connection with my first description of Fig. 17, and wind and employ that winding for the purposes there explained.

In order to obtain a means of connection between A and B wholly internal, and thus produce a top externally resembling an ordinary top, and not requiring the manual skill required to spin tops hereinbefore described, as having their means of connection within the light top, I adopt the modification shown in Figs. 22 and 23. In carrying out this modification the construction throughout is the same as that shown in Fig. 9, except that I fix only one cord reversing peg in the stem C, and that I dispense with any elasticity in the roof of B, the washer M, and the serration of the lower annular face of the stem C. I also leave more space between the fly wheel periphery and the light top so that there is room left for the necessary movement of a wire loop R, which I place within the light top as shown, securing it by reversing its ends through two or three small holes drilled in the light top, as indicated at R'. In the rim of the fly A I drive a hook or hooks *r*, as shown more clearly in the plan Fig. 23. The loop is preferably made of thin piano wire and is so adjusted that when at rest it presses lightly on the periphery of the fly A. When the former part of the cord is begun to be pulled off, so as to spin B as per the outer arrow in the plan, then R catches in one of the hooks *r* as shown and drags A around, and when the cord has slipped from the peg *g*² and the contrary spinning of B is begun, the loop R is disengaged from the hook *r* and thrown out against the light top's side by centrifugal force, thus leaving B free to be spun contrary to A. As the speed of B becomes reduced the end of loop R, returns if made sufficiently elastic, into the path of the hooks *r* previous to the stop-

page of B. The hooks then rub past the loop end or strike it in their passage, and thus the loop R and hooks *r*, assist in producing stopping, reversal and acceleration in that reversed direction of the spinning of the light top B. As the loop R might be damaged by the top being spun with the cord wound and reverse wound with the knot at the wrong side of the knot peg *g*², I bevel away one side of the cord reversing peg *g*², as shown in Fig. 24, so that the cord can only be held by *g*² when properly wound. The peg *g*² may also be thus beveled, but is not so treated when I desire that the operator may spin the light top B, contrary to the outer arrow in plan, by non-reversed winding if he chooses. I may employ two or more loops R, as well as any number of hooks *r*.

As a modification of the method just described, I may attach the loops R to the fly A, instead of to the light top B, as shown in Figs. 25 and 26, and I may arrange two sets of hooks *r* and loops R, so that it shall be immaterial to which side of the knot peg *g*² the knot is placed when the cord is to be reversely wound. In carrying out this modification I make the fly A with a deep rim. Inside of that rim I attach an upper loop or loops R⁴, so as to engage with the upper hook or hooks *r*⁴ fixed in the drum S carried by the light top B and partly situated within the rim of A. In this drum S, I further fix a lower hook or hooks *r'* pointing oppositely to the hooks *r*⁴, as seen clearly in Fig. 26, and in the rim of A, I fix a loop or loops R² oppositely disposed to the loops R⁴, so that the loops R² may engage with the hooks *r'*. I also locate the upper loop or set of loops R⁴, relatively to the lower loop or set of loops R², on the inner side of the rim of A in such a way that when the loop or set of loops R⁴, is engaged with the hook or set of hooks *r*⁴, as in Fig. 26, then the loop or set of loops R² is clear of the hook or set of hooks *r'*, and vice versa. The drum S is fixed to or may be part of the light top B, whose construction is otherwise the same as that of the light top B, in Fig. 22, except that the winding stem C is, as in Fig. 8. The ends of the wire forming the loops are shown in dotted lines, and are roved through small holes in the rim at R', and I close the soft metal of the fly upon them, or I may otherwise attach them. On the light top B being spun as per arrow 1, in Figs. 25 and 26, the hook *r*⁴ drags the fly A around by the loop R⁴, while centrifugal force lays the loop R² against the inner surface of the fly's rim as shown. When the reverse wound part of the cord begins to spin B, as per arrow 2, the hook *r*⁴ is disengaged from the loop R⁴, which then is likewise taken out of the way of the hooks *r*⁴, and the light top is thus left free to be spun oppositely to A. I may make my loop or loops of any degree of stiffness, so that they shall return into the path of the hook or hooks earlier or later during the top's performance, according as they are made stiffer or less stiff.

I place the hooks r' at a lower level than the loops R^4 , in order that they may never damage the loops R^4 when the light top B is spun, as per arrow 2, and the hooks r^4 are at a higher level than the loops R^2 , for a like reason. In this modification I may omit either the upper or the lower hook and loop arrangement, in which case I suitably bevel one side of my knot peg or cord reversing peg g^2 .

It is to be understood that in these last modifications I do not limit myself to thus applying my improvements to solid tops, but that I may also thus apply my improvements to any suitable hollow top, as that in the figure.

When my improvements are applied to a solid top I proceed as shown in Figs. 27 and 28, in which B' represents the solid top, being merely a disk of metal though it may have any other suitable form. A' is the fly in the form of a heavy rimmed top, made in two or more pieces. I plug the hollow spindle a' of the fly A' with a drilled plug E' and in that plug I fix the holder pin F , which is furnished with a loose holder e as hereinbefore described. In the lower end of F I form a female center and between that center and the female center in the fly pivot a^{10} , I place the solid stem C' of the solid top B' , on the upper side of which I provide a pin p^{10} which is caught by the hook of the spring s which is fixed inside of A' , as shown, and is provided with a wire bridge s' to keep it from being dragged out of form when A is dragging B' around by the pin p^{10} .

I paint the upper surface of B in any way suitable to produce optical illusion and chromatic effect, as for instance, as shown in strips whose boundaries are involute curves, and whose colors I make, for instance, alternately red and blue. I make the whole as light as possible because the fly A' has to be reversely spun, as per arrow 2 on the plan Fig. 28, after that it has spun the light solid as per arrow 1, and when a heavy fly is necessary I may adopt the means of connection and disconnection shown by Figs. 12 and 13, as hereinbefore described. When A' is thus reversely spun, as per arrow 2, then the spring s is carried out of the path of pin p^{10} and kept out of the way of such until long after B' has been reversely spun by the friction at the centers of C' and the air friction. As the hook of s might be damaged by wrong reverse winding and spinning I bevel off the proper side of the cord reversing peg and make the flange of E' so small that g^2 cannot be used by mistake for a knot peg g' . Though this modification is specially designed to meet the requirements of solid tops, yet I may in the same way apply my improvements to any suitable hollow top. In order to utilize gravitation to secure connection by means wholly internal in addition to utilizing centrifugal force as a means of securing sudden disconnection, I adopt the modification shown in Fig. 30, and in which I drill two holes near the hub of the fly A , one at each end of a

diametrical line. Through each hole I drop a loose fitting pin or pendulum arm T , which I restrain from falling out when the top is inverted, by grooving it at t and spring a small wire ring into the said groove. Each pin t has a head t' as shown, so that it cannot fall through the hole in which it works. The pin holes are widened outward below to allow the pendulum arms T to swing out to their dotted positions. The pivot b of the top B is fixed, in the example shown, directly to the body of the top B and on the inward continuation of the pivot wherein the female center for the spindle a is formed I fit a clutch N^2 , shown in plan in Fig. 31. The fly A being at rest if the top B be spun as per arrow 1, then the clutch N^2 will engage with the arms T which are then hanging as in full lines, and the fly A will be driven around by the top B . When reverse spinning is begun, N^2 will release the arms which are then instantly flung out to their dotted positions by centrifugal force, thus leaving B free to be spun oppositely to A .

Besides the form of clutch shown in Figs. 30 and 31, I may employ any one of the clutches shown in Figs. 29, 29^a and 31^a. Fig. 31^a is a one way driving clutch and in using I bevel one side of the reversing peg. Fig. 29 is a two way driving clutch and its object is to diminish the shock which can be given to the arms by any one jerking the outer top around backward and forward in trying to guess how it is worked, and Fig. 29^a is a two way driving clutch and its object is to assist centrifugal force by means of its eccentric back tending to throw the arms T out of gear should there be any danger of their becoming stiff from dust or other cause.

In order to utilize the strain that is put on the spinning cord as it is coiled around the stem C , for the purpose of accomplishing connection of the top B with the fly A , I adopt the modification shown in Fig. 32, and further illustrated by Figs. 33 to 36^b inclusive. In carrying out this modification I groove the plug d' of the stem C , as shown in Fig. 34, which is a sectional plan of the stem C in the plane of section coinciding with the axis of the screw t'' . Down through the groove I pass a straight wire t^2 to serve as a spring and I secure it by the screw t'' which is screwed through the thimble U , which I use in order to obtain a good hold for the screw thread and also because it keeps the mouth of C from being bulged by the driving of the plug d' , and I secure the plug d' still further from turning and carrying the groove and wire t^2 away from the point of the screw t'' by driving into it the knot peg g' . I drill and female center the plug d' and make to work in it the upper end of the fly spindle a . Outside of the top B , and near the foot of C , before fixing on the flanged piece u , I solder on a small hub u' . I then drill a hole through this hub and through C , and after filing away the lower half of the hub, I drive on the flange u right

up against it, thus obtaining a passage for the plunger V to slide in without turning. I notch the outer end of the plunger V to receive the winding cord, and I notch the inner end of it, as shown in Figs. 36, 36^a and 36^b, to catch hold of one or other of the toothlike ridges *v* formed in the fly spindle *a* opposite the plunger by filing out between them or otherwise. In order that the ridges on fly spindle *a* may not slip from the grip of the notch in V by deflection I fit the lower end of the tube C with a bush *v'* and I slot this bush where the wire spring *t*² has to pass, and drill it where the plunger has to pass. To secure this bush from turning, I drive into it the cord reversing peg *g*² and to prevent the plunger V from entirely leaving the passage it works in, I may drive a small pin *u*² into the flange of C, as seen in Fig. 35. The notch in the inner end of the pin or plunger V is made deep enough not only to grip the fly spindle ridges or teeth, but also to accommodate the end of the spring *t*², as shown in Fig. 36. This top may be reversely wound either way, and the method of winding is shown in Fig. 35, where the cord is shown right handed down C, then half turned round the peg *g*², then strained tight across the end of the plunger V, thus forcing it into the position shown in Fig. 36, so as to grip the fly spindle, and finally the remaining part of the cord is wound left hand upward on C. When the cord thus wound is pulled then C turns, as per arrow 1, in Fig. 36, and the top B drags the fly A around with itself. By referring to Figs. 36^a and 36^b, in connection with Fig. 35, it will be seen that the spinning cord releases the plunger V, and so disconnects A and B, about one half of a turn of C, previous to the cord slipping from the reversing peg *g*², so that if the cord be properly wound, reverse spinning of B cannot be begun by the cord until B is disconnected from A. Fig. 36^a represents a position about a sixth of a turn of C after the release of V, and Fig. 36^b, shows the immediately succeeding position, when the cord slips from off the reversing peg *g*² and passes to and pulls from the opposite side of C, so as to revolve C as per arrow 2, and independently of the fly A, whose spindle *a* is, as shown, free from the grip of the plunger, and spinning as per small arrow.

In the construction shown in Fig. 33 the top B and the fly A are constructed and arranged substantially as shown in Fig. 32 and therein I also illustrate a modification whereby a ratchet wheel X fixed to B drives the fly A, by acting on the pawl *w'*, which is mounted on a suitable joint pin *w*² screwed or driven into the fly A, in the rim of which I drive a pin *w*³ to prevent the pawl *w'* from being flung so far back as to rack the spring *w*. Into the hub of the pawl *w'* I drive a pin *w*⁴ which stops against the rim of the fly, as shown in the plan, so that the driving point of the pawl when the top is being put together cannot get nearer to the axis of the top than the radius at the bottom of the

ratchet teeth. By these means I secure that the upper part of B can quite easily be fitted on to the lower part in making the top. The ratchet wheel X has a drilled hub and is secured to the stem C by the hub being forced therein and pinned with the knot peg *g'*, which I place at the bottom of C in this case. The parts shown in Fig. 32, and not mentioned in this description, are not required in carrying out this modification.

The spindle *a* passes easily through the drilled hub of the ratchet wheel X and works above in the plug *d*, as shown. In this case I bevel one side of the cord reversing peg which I now place near the upper end of C. I make the flange of *d* so small that *g*² cannot be used by mistake for a knot peg. In order that the simultaneous opposite spinning of A and B obtained by the reverse winding of two ends or parts of the spinning cord, as described with reference to Figs. 1 to 5 inclusive, which has the fly's spindle *a* projecting beyond B's stem may be accomplished, without the trouble of such reverse winding, I adopt a modification of that top, as illustrated in Figs. 37, 37^a, 37^b, and 37^c. Instead of winding one end of the cord on a tubular stem fixed to the projecting part of the spindle of the fly A, I utilize that projecting part to carry a straddle or forked bracket *x* turning easily on it and carrying the bevel pinions *x'* and *x*², which run freely on the pins *Y'* and *Y*² secured to the bracket by the screws *y'* and *y*², passing through holes in the ends of the pins *Y'* and *Y*². In the upper end of C I fix a bevel wheel *x*³, and in the lower end a bush *x*⁴, as clearly shown, and the spindle *a* runs freely in these, and is restrained from end shake by the bush *x*⁴ and its bearing in pivot *b*. The bevel wheel *x*⁵ is secured first on *a* by the screw *y* or otherwise. The upper end of the bracket *x* is plugged with a tapped plug Y through which I pass a tight fitting milled headed screw Z having a hardened point and a female center therein. The plug Y is prevented from slipping out of its place by a small pin or screw *y*³, Fig. 37^a. The upper male center on the spindle *a* works in the female center of the screw Z, so that by working the screw Z through the plug Y, the adjustment of the bracket *x* is effected, so that the bevel wheels *x'* and *x*² shall not be too deep in gear with the bevel wheel *x*⁵, and so also that when the bevel wheel *x*⁵ is in easy working gear with the bevels *x'* and *x*², it shall yet be clear of the bracket *x* at Z', as shown. When these conditions are fulfilled and the screw *y* is set up tight, then though the top be firmly held down to steady it while spinning it, yet the gearing works with the minimum of friction, since all the pressure is sustained by the centers of the spindle and by the screw Z and the pivot *b*, no downward pressure being transmitted to the body of the light top B, nor to the gearing. Over the stem C I fit a vulcanite or other light sleeve C' to increase the diameter of the stem, and I

restrain C' from turning by driving through it into the stem C the knot peg g' . As may be seen in Fig. 37^c I utilize the inward ends of the pins Y' and Y², whereon the bevels x' and x^2 run, to assist in steadying the bracket x , by fitting them as bearings on the spindle a . At the upper end of the shank of the bracket x , I fix a light fitting ring y^4 , of light wood or other material. I then take a light short tube y^5 closed at the upper end and notched at the bottom, so as to engage with the screw heads y' and y^2 , and be by them restrained from descending too low and from slipping around on the bracket. I slip this tube y^5 on the ring y^4 and push it down till its notches engage the screw heads aforesaid and utilize it, both as a dust cover to the gearing, and as a holder for the top, and further as an alternative means of spinning the top, and as its behavior is a feature of interest while the top is spinning, I place a star or other device on its upper end that its behavior may be more easily observed. When the top B is spun as per arrow 1, the holder y^5 and bracket x being at the same time restrained from turning, by being held in the hand, then the fly A is simultaneously spun opposite to B by the bevel gearing. When the cord has been pulled off and the holder let go, then A and B continue spinning oppositely. The holder y^5 is at first then a feature of interest, as on being let go instead of at once beingspun around with the top B, it is caused by the gearing to begin slowly to turn oppositely to B, and has its speed increased in that direction as B has its speed diminished.

As a modification I may dispense with the screw y , and in lieu thereof, fix a spline or key y^6 in the spindle a and slot a passage, Fig. 37, for it in the bevel wheel x^5 , so as to enable x^5 to slide freely on a . I then fix a pin y^7 so that its point shall engage with a groove y^8 turned in a wide enough to allow the spring y^a which I now place inside the shank of bracket x to lift the bracket, and the gearing carried by it, out of gear with bevel x^5 , when after pulling off the cord from C' the holder y^b is let go. I thus insure that A and B shall be connected while the top is being held down during the pull of the cord, but entirely disconnected, save at their bearings after the holder is let go, thus reducing the wear of the gearing. When this is done the holder if left to itself no longer behaves during the top's performance as previously described. I employ three screws like that shown at b^6 to hold the two parts of B together, but I may adopt any other convenient means.

I may omit one of the pinions x' or x^2 , as x' leaving its pin Y' to assist in steadying the bracket x and thus simplify the gearing.

I may combine both the modifications just described in one top, so as that by pushing down the holder y^5 , and setting up the screw y , the gearing shall always remain in gear and the top be then inverted, while by slackening the screw y the gearing shall be out of

gear except when the holder is pressed down.

With the object of dispensing with the reverse winding of two parts of the cord when the fly wheel and its spindle are entirely within the top B, and also in order to obtain simpler gearing more easy of construction I adopt the modification shown in Figs. 38, 38^a and 38^b. In carrying out this modification I provide a light stiff sheet metal bridge 7, secured diametrically across the lower part of B, as shown, by screws or otherwise. At the center of bridge 7, I fix a drilled bearing piece 8, and arrange the fly spindle a to run therein, and also in the center of pivot b . On the upper end of a which projects above 8, I fix a spur pinion 9 of suitable diameter.

Through the stem C of the upper part of B, I pass a strong, stiff, preferably steel, rod or wire F', of a suitable length beyond the stem to the outside and to the inside of the top B, and having that part of it which projects inside B straight but set at an angle with the top's axis by bending the said set end of the wire. F' carries a pinion 10 working freely on it and having a long hub. Over the long hub of 10 I force the close coiled part of a spiral spring 11 and secure it to the said hub by solder or otherwise. That part of the spring 11 which does not surround the hub is open coiled as shown and has at its end an eye formed, as seen in Fig. 38^b, through which I pass a small screw and secure that end of the spring to the top as shown. Over the outward or upper end of the wire F I slip a short light spring 12, and above the spring an adjustable collar 13, and finally I fix the holder knob e tightly on to the remaining part of the wire F'. When the parts described are properly adjusted, and in the position shown in Fig. 38, then A and B are disconnected save for their bearings. When pressure is put on e to steady the top during the pull of the cord then the inward portion of the wire or rod F' descending pushes the pinion 10, as per arrow 14, into gear with the pinion 9, as shown in Fig. 38^a, without in so doing appreciably extending the spring 11. When the pinions have thus been put sufficiently in gear the stop collar 13, prevents further descent of the holder e and the wire F'. On the cord now being so as to spin B, as per arrow 15, then the wire F' being restrained from turning by the hand which grasps the holder e , the top by means of the spring 11 revolves the pinion 10 about the wire F', in the same direction as itself, and therefore the pinion 9 and the fly A, are oppositely spun to B. On the holder e being let go when the cord has been all pulled off, the spring 12 returns the wire F' upward and the pinion 10 is taken out of gear in the direction contrary to the arrow 14, and A and B are disconnected and left free to spin oppositely and independently save for friction.

In order to dispense with the spring 12, I adopt the modification shown in Fig. 39, and in which I drill the hub of pinion 10 only

partly through and form the end of the wire on which the pinion 10 works to be a male center as seen in dotted lines, and as aforesaid I omit the return spring 12 but retain the stop collar 13. Pressure on the holder *e* in this case puts the pinion 10 into gear with pinion 9, by extending the spring 11 and carrying pinion 10 downward, as per arrow 16, to its dotted position. When the holder *e* is let go the spring 11 contracts and restores pinion 10 to the position shown in full lines. As a further modification, I arrange the parts so that the pinions 10 and 9 are at all times in gear, and I explain this modification with the assistance of Fig. 39 as follows: I groove the wire *F'* as shown at *H'* in dotted lines and restrain it from sliding through *C* by engaging the inner point of the knot peg *g'* to work freely in that groove. I fix the collar 13 on the wire *F'*, as per dotted lines, so as to maintain the point of *g'* in the groove when the top is held down, and I adjust the pinion 9 on the fly wheel spindle, as shown in dotted lines, so that when the two parts of the top *B* are put together the pinion 9 is sufficiently in gear with the pinion 10. I retain in this modification the male center on the end of wire *F'* working in the hub of the pinion 10 as shown. The behavior of the holder *e* now becomes a feature of interest during the top's performance as hereinbefore described.

As a modification of my hereinbefore described method of producing optical illusion and chromatic effect, I may proceed as illustrated by Fig. 40, which is a part sectional elevation of the top, shown in Fig. 12, but in Fig. 40, I wish *B* to be understood not only as a light top when *A* then will be understood as a fly, but also *B* to be alternatively understood as being a heavy rimmed hollow top or fly, when *A* then will be a light top. In carrying out this modification I cut an opening or openings *h* in *B*, and I color or paint the rim of *B* any suitable color or colors or black. I also paint or color a segment 17, or successive segments of the rim of *A* black, or with any suitable color or colors, alternate or different paints or colors being applied to successive segments. When *A* and *B* are spinning at different speeds in the same direction or at the same or different speeds in opposite directions, then if the rim be viewed optical illusions and chromatic effects are produced by these means as described.

I claim—

1. A spinning top having two rotatable parts, one part having a support adapted to sustain the entire top, and the other part hav-

ing supports in the first said part, in combination with means substantially as described, for rotating the said parts simultaneously in opposite directions, as and for the purposes described.

2. A spinning top having two rotatable parts or flies, one being relatively heavy, and one part having a bearing point whereby the entire top is supported and the other part or fly having bearings in the first said part, whereby it can rotate independently thereof, in combination with means for rotating the said flies simultaneously in opposite directions, substantially as described.

3. A spinning top having an exterior rotatable shell *B*, and a heavy fly wheel *A* within the shell, the bearings whereby the shell and fly wheel are free to rotate independently of each other, in combination with means for rotating the said shell and fly wheel simultaneously in opposite directions, substantially as described.

4. A spinning top having two independently rotatable parts, a stem for the spinning cord, means for connecting the two parts together during part of the spinning operation to cause them to rotate in the same direction, and the reversely wound cords upon the said stem, substantially as described.

5. A spinning top having two independently rotatable parts or members, one being relatively heavy, and one having a cord receiving stem provided with a cord retaining peg and a cord reversing peg *g'*, and means for connecting the two members or parts of the top during a portion only of the spinning operation, and means for rotating the said parts in opposite directions simultaneously, substantially as described.

6. A spinning top having two parts or members which are independently rotatable, one of them being relatively heavy, and one being provided with a stem for the winding cord a clutch between the two members adapted to unite them during a portion of the spinning operation, and the spinning cord reversely wound upon the said stem, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

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