(No Model.)

W. N. HUTCHINSON.

NAVIGABLE BALLOON.

No. 548,053. Patented Oct. 15, 1895.

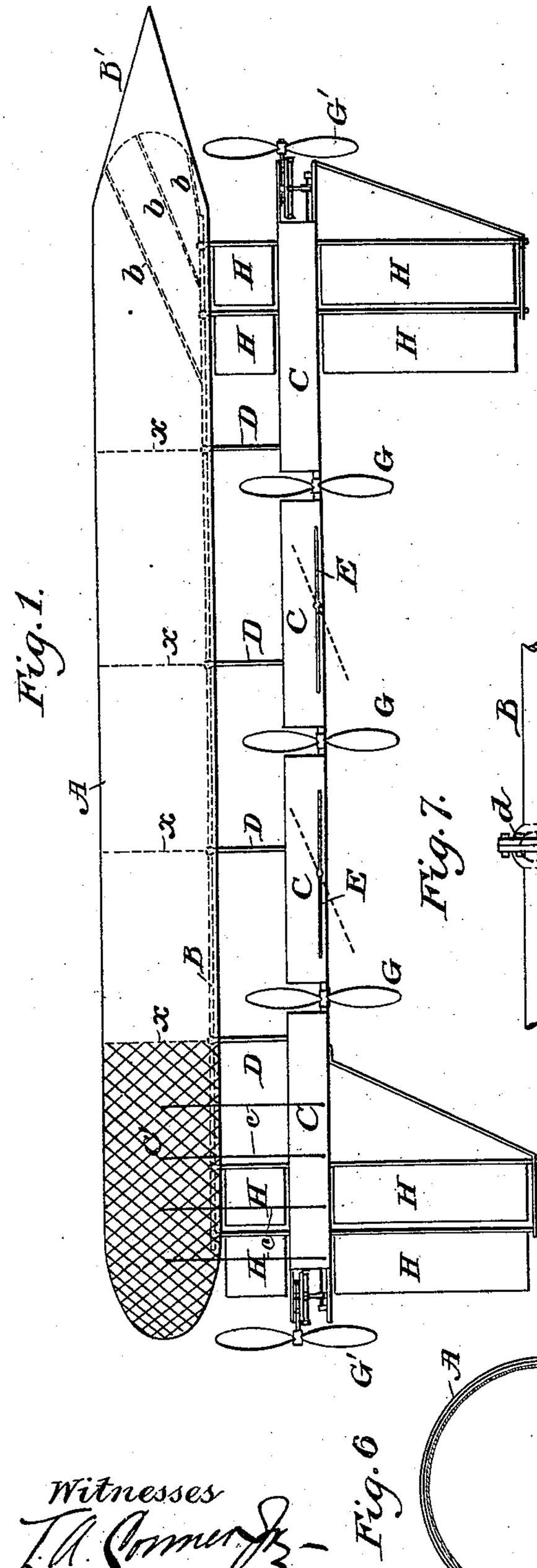

Fig. 1.

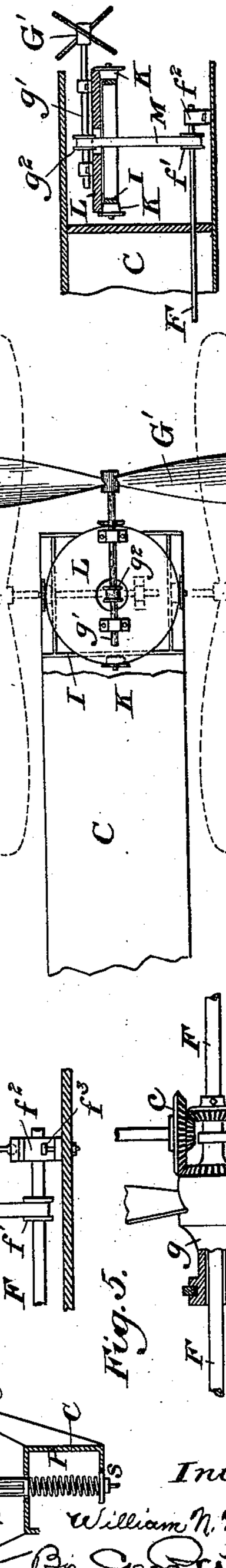

Fig. 3.

Fig. 2.

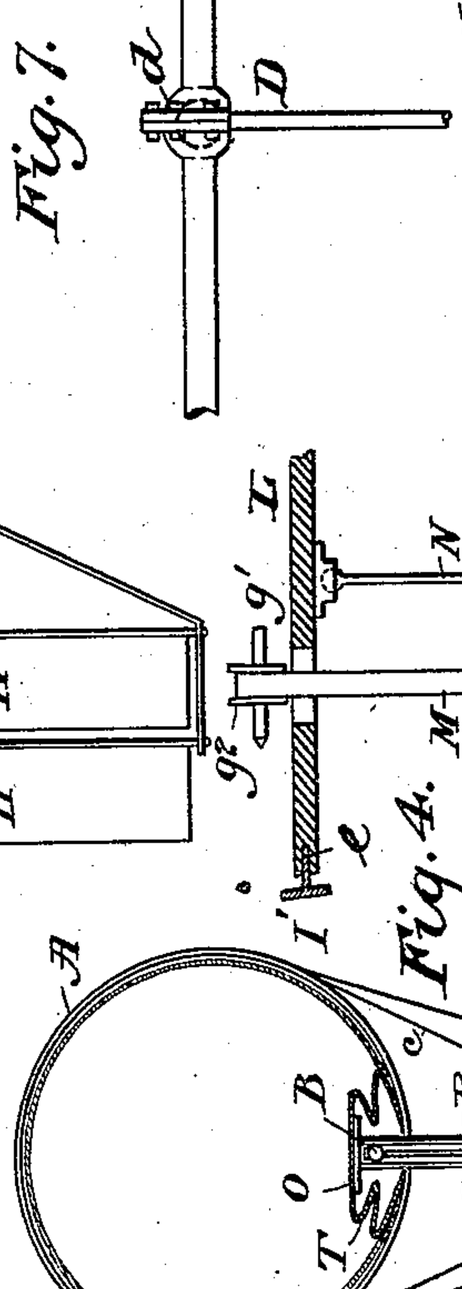

Fig. 7.

Fig. 6

Fig. 4.

Fig. 5.

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WILLIAM NELSON HUTCHINSON, OF EASTBOURNE, ENGLAND.

NAVIGABLE BALLOON.

SPECIFICATION forming part of Letters Patent No. 548,053, dated October 15, 1895.

Application filed May 1, 1895. Serial No. 547,787. (No model.) Patented in England November 23, 1893, No. 22,483, and June 1, 1894, No. 10,610.

To all whom it may concern:

Be it known that I, WILLIAM NELSON HUTCHINSON, a citizen of Great Britain, residing at Eastbourne, in the county of Sussex, England, have invented certain new and useful Improvements in Navigable Balloons, (patented to me in Great Britain November 23, 1893, No. 22,483, and June 1, 1894, No. 10,610;) and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to navigable balloons, and its objects are to aid the steering by making end propelling-screws turn in a horizontal plane and to keep the skin expanded automatically by means of a loose inner skin or lining at the bottom of the balloon acted upon by springs.

In the accompanying drawings, Figure 1 is a side elevation of a balloon embodying my improvements. Fig. 2 is a detail plan view, on a larger scale, of one of the end propelling-screws. Fig. 3 is a sectional elevation of the same. Fig. 4 shows a modification. Fig. 5 shows the gearing for driving the intermediate screws. Fig. 6 is a cross-section of the balloon, and Fig. 7 is a detail.

The balloon A is of cylindrical shape, since this is the best for carrying the volumes of gas necessary to float the weight of efficient far-traveling balloons with their indispensable accessories. Even in this form there is a limit to the diameter, but practically none to the length, provided all waving motion in flight be prevented.

Lying within the balloon and lengthwise of it is a tube B, preferably of tough aluminium alloy and about one foot in diameter. It is virtually a backbone and gives the required firmness. The front end of the balloon is covered by a pointed conical prow B′, also of aluminium alloy and supported by braces *b* running from the tube B. This cone pierces the air and prevents the balloon from caving in.

The cars C, of which there may be any convenient number, are hung below the balloon by means of cords *c*′ from the net C′ encircling the balloon. Upright rods D are connected to the backbone B and to the cars by ball-and-socket joints *d*. The sockets are of unusual depth, so that the balls may have a little free play. The cars lie preferably in line, as shown, and on the sides of one or more are horizontal rudders E, by means of which the balloon is made to rise and sink without change of horizontality.

A driving-shaft F runs lengthwise through all the cars and imparts motion to the propelling-screws. Since there is a limit to the diameter of these screws, it is necessary to employ a number of them in a large balloon. The cylindrical shape of the balloon is well adapted to a multiplicity of screws, because they can be arranged one before another along the entire length of the balloon.

The screws G between the cars are provided with short tubular shafts *g*, sleeved upon the main shaft F. The adjacent ends of cars C are held in position by their attachment to the extremities of this tubular shaft *g*, as shown in Fig. 5. On the main shaft is a bevel-gear *f*, which, by means of an idle-gear *c*, drives the screw G. By varying the proportions of these gears the speed of the screw can be regulated.

The longer the balloon the greater the difficulty in steering it. Vertical rudders H are provided at front and rear, but they have little influence unless the speed be good, and their tendency is to check the speed. I therefore provide for steering by the leading and rear screws G′, which are so connected with the driving-shaft as to be capable of turning to one side or the other in a horizontal plane. This may be accomplished in a variety of ways. I prefer the construction shown in Figs. 2 and 3, in which the roof and floor of the end cars are extended to form an open chamber or balcony, in the upper part of which is a stationary frame work of bars I, supporting a set of coned antifriction-wheels K, on which rests a circular platform or turn-table L, held in position by flanges on the rollers. A counter-shaft *g*′, carrying the screw G′, is journaled diametrically on the turn-table and has secured to it a pulley g^2, located

over the center of the turn-table. An endless belt M runs over this pulley down through a hole in the turn-table to another pulley f' on the main shaft F. By this construction the turn-table and its screw can be turned to one side or the other, as shown in dotted lines in Fig. 2, without destroying the connection between the main shaft F and the counter-shaft g'. Since the strain on the belt increases as the table is turned by the aeronauts, the belt is made elastic, or instead of an elastic belt I may use a slack driving-chain running over sprocket-wheels, or the journal-block f^2, Fig. 3, of the main shaft may be held loosely by upright bolts f^3, so as to be capable of slight vertical movement. A link-rod N is then attached by a ball-and-socket joint to the under side of the turn-table adjacent to the opening through which the belt runs. The lower end of the rod is attached by a similar ball-and-socket joint to the journal-block f^2. When the table is turned, it raises the journal-block and with it the end of the main shaft, so that the belt always travels in uniform tension.

To prevent the turn-table from tilting under the weight of the screw G', a groove l is made in the edge of the rear half of the table, with which engages a fixed transverse horizontal bar I'.

It is very desirable to keep the skin of a navigable balloon, whether cylindrical or of other shape, constantly extended, however great and sudden may be alternations in the bulk of the confined gas. I accomplish this automatically by the following means: Immediately above the backbone B, which acts as a condenser, lies horizontally a light basket-work frame O the length of the backbone and of a width most suitable for the spring P to push the frame upward by means of the fork R straddling the backbone B. The springs are supported and adjusted by nuts s on the lower ends of bolts S, springing from the floors of the cars. Inside the bottom of the balloon is a loose lining T, the central part of which rests on a framework O. The springs keep the lining pushed up against the tension of the gas, so as to yield to any increase in its volume or take up any decrease and thus preserve the shape of the balloon. The weight of the extra loose lining within the extended cylindrical skin is of little moment.

If desired, the balloon may be divided into sections transversely, the several sections being inflated separately after being laced to the backbone. By adding or taking out sections the balloon may be lengthened or shortened. This construction is indicated by the dotted lines x in Fig. 1. If a cylindrical balloon be doubled in size by doubling its length, only a trifle is added to resistance to progress, while the space for the propelling-screws is doubled.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A navigable balloon provided with a longitudinal main driving shaft rotating in fixed bearings secured to the car, a horizontal turn-table adjacent to said shaft and carrying a countershaft, a screw mounted on said countershaft, and driving connections between said two shafts, substantially as described.

2. A navigable balloon provided with a longitudinal main driving shaft rotating on fixed bearings secured to the car, a horizontal turn-table located near said shaft, and carrying a countershaft, a screw mounted on said countershaft, and an endless belt connecting said two shafts, substantially as described.

3. A navigable balloon provided with a main driving shaft, a turntable carrying a countershaft, a screw mounted on said countershaft, an endless belt running through an opening at the center of the table and connecting the two shafts, and a link for keeping a uniform distance between the shafts, substantially as described.

4. A navigable balloon provided with a main shaft having its end journaled in a vertically movable journal block, a turntable carrying a countershaft, a screw mounted on said countershaft, an endless belt connecting the two shafts, and a link-rod attached at one end to the turntable and at the other end to the journal block, substantially as described.

5. A navigable balloon provided with a turntable carrying a screw, said table having a groove in its edges, and a fixed transverse bar engaging with said groove, substantially as described.

6. A navigable balloon provided with two or more independent cars hung below the balloon one behind the other, a main shaft running through all of said cars, and propelling screws arranged between the cars and driven by said shaft, substantially as described.

7. A navigable balloon provided with two or more cars, a main driving shaft running through said cars, and screws having short tubular shafts sleeved on the main shaft between adjacent cars, substantially as described.

8. A navigable balloon provided with two or more cars, a main driving shaft running through said cars, and screws having short tubular shafts sleeved on the main shaft between adjacent cars, said cars being attached to the ends of said short tubular shafts, substantially as described.

9. The combination with a cylindrical balloon A, of a tubular metallic back bone B arranged inside of said balloon, and a conical metallic prow B' connected with said backbone by braces b, substantially as described.

10. A cylindrical balloon provided with a metallic back bone, one or more cars, and upright rods connected at each end by ball and socket joints with said back bone and said cars respectively, substantially as described.

11. A navigable balloon provided at the bottom part with a loose lining, and an automatic tension device for keeping said lining pressed against the gas, substantially as described.

12. A navigable balloon provided at the bottom part with a loose lining, and springs tending to force said lining inwardly, substantially as described.

13. A navigable balloon provided with a metallic back bone, a loose lining, and springs attached to said back bone, and acting against said lining, substantially as described.

14. A navigable balloon provided with a metallic tubular back bone, a loose lining, a basket frame above said back bone and under the lining, and springs pressing against said frame, substantially as described.

15. A navigable balloon provided with a metallic tubular back bone, bolts attached to said back bone, springs surrounding said bolts, nuts for supporting and adjusting the springs, forks resting on the springs and extending up past the back bone, a frame work supported on the ends of the forks, and a loose lining spread over the framework, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM NELSON HUTCHINSON.

Witnesses:
JOHN J. COLLINS,
THOS. P. ROGERS.