No. 697,437. Patented Apr. 15, 1902.

# W. C. BOONE.

## ROPE LAYING MACHINE.

(Application filed Nov. 3, 1896.)

(No Model.)

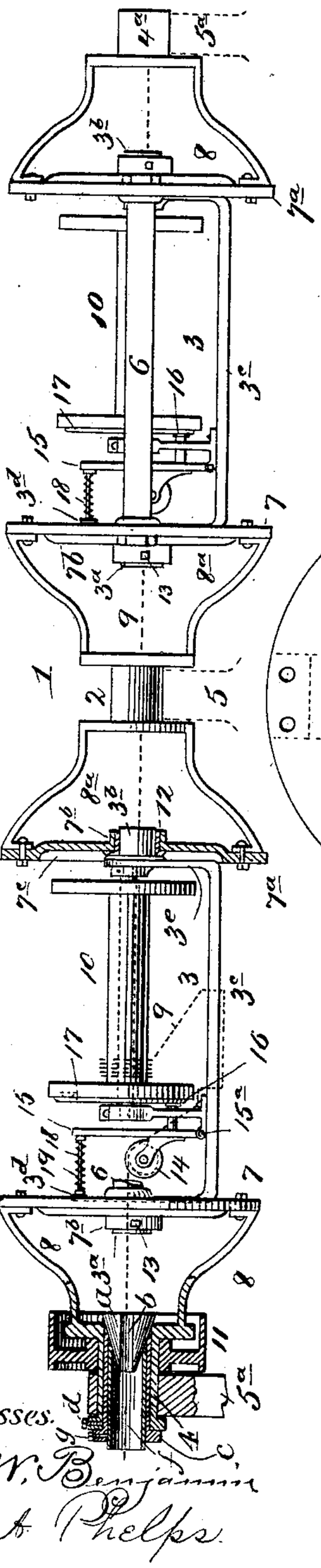

Fig. 1.

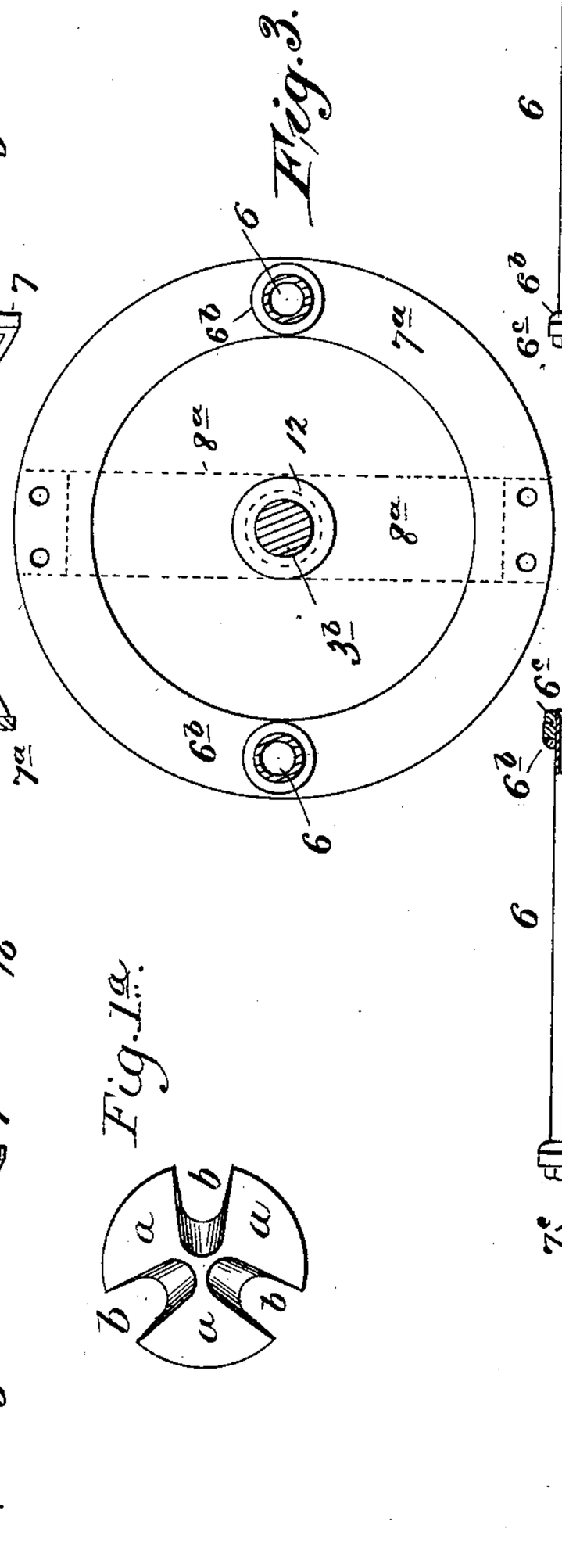

Fig. 3.



Fig. 1a.

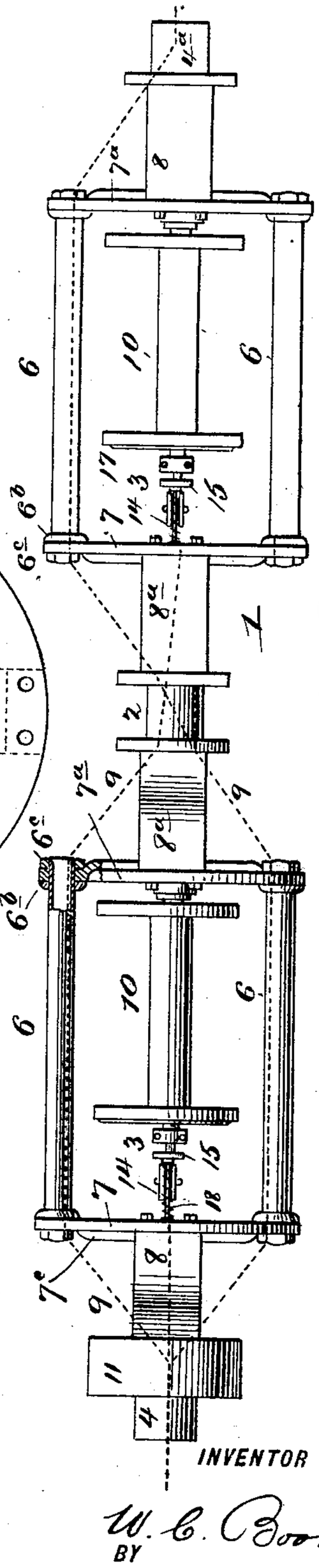

Fig. 2.

Witnesses.
C. W. Benjamin
C. A. Phelps.

INVENTOR
W. C. Boone
BY
T. F. Bourne
his ATTORNEY

# UNITED STATES PATENT OFFICE.

WILLIAM C. BOONE, OF BOONTON, NEW JERSEY.

## ROPE-LAYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 697,437, dated April 15, 1902.

Application filed November 3, 1896. Serial No. 610,950. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM C. BOONE, of Boonton, Morris county, New Jersey, have invented certain new and useful Improvements in Rope-Laying Machinery, of which the following is a specification.

My invention relates to improvements in the class of rope-laying machinery shown in the patent to Pittman, dated January 24, 1860, No. 26,894, wherein there is shown a flier provided with two cradles, and between these cradles a hollow central journal is located for the passage of one or more strands to the laying-top. In this class of machines, however, as known to me the strands were led along the outside of the flier-arms, and it very often happened that the strands would break and become wrapped firmly around a cradle and the flier-arm adjacent thereto, which would cause injury or breakage to the machine.

The object, therefore, of my invention is to prevent the strands from becoming wrapped around the cradle and the flier-arm; and to this end the invention consists in a flier adapted to sustain cradles and having a central hollow journal, the arms of the flier being made hollow or tubular to permit the passage therethrough of the strands that lead from the bobbins to the laying-top. By this means the strands are covered where they pass in line with the cradle, and if the strand should break the tubular arm through which it passes will keep it from wrapping around the cradle.

Another object of the invention is to reduce the air resistance upon the rotative flier, and for this purpose the flier is provided with circular heads or disks, (instead of radial arms, as heretofore used,) to which heads or disks the longitudinal arms are connected, the flier also having a central hollow journal which is connected by suitable arms to said circular heads or disks. The circular head or disk also serves as a journal or support for the cradle.

The invention further consists in the novel details of improvement and the combinations of parts, that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a side elevation, partly in section, of a flier for rope-laying machinery embodying my invention. Fig. 1ª is an end view of the cone of the laying-top. Fig. 2 is a similar view taken at right angles to Fig. 1; and Fig. 3 is a face view, on an enlarged scale, of one of the circular heads or disks of the flier, showing the tubular or hollow arms and the cradle-journal in section.

In the accompanying drawings, in which similar numerals of reference indicate corresponding parts in the several views, the number 1 indicates generally the rotative flier of a rope-laying machine, which has a hollow or apertured journal 2, located between two cradles 3, and a hollow journal 4 at the front end, in which a suitable laying-top may be placed, and also a corresponding journal 4ª at the opposite end. The journal 2 rotates in a suitable support or bearing 5, (shown in dotted lines in Fig. 1,) and the journals 4 4ª rotate in suitable supports 5ª 5ª.

6 6 are the arms of the flier, and 7 7ª are circular heads or disks to which the respective flier-arms 6 of each portion of the flier are connected. The heads or disks 7 7ª are secured to arms or spiders 8 8ª. The arms 8ª 8ª are connected to the intermediate hollow journal 2, and the arms 8 8 are secured to the journals 4 4ª. The arms 8 8ª are shown detachably connected with the corresponding heads or disks 7 7ª, being shown bolted thereto, the central journal 2 having two pairs of arms projecting from it, each pair being detachably connected with a corresponding head or disk. The parts 2, 4, 4ª, 6, 6, 7, 7ª, 8, and 8ª being firmly connected together constitute the main rotative portion of the flier. In the drawings I have illustrated a double flier having an intermediate hollow journal 2; but it is evident that the flier may be enlarged so as to accommodate more cradles 3, if desired, in which case a hollow journal 2 will be placed between each pair of cradles 3.

The laying-top above mentioned may be arranged as follows:

*a* is a cone which projects into the hollow journal 4 and is secured thereto. This cone has peripheral grooves *b*, which converge to the apex for the passage of the strands.

*c* is a tube-holder, which is hollow and is located within journal 4, and may be held therein by a set-screw *d*.

*f* is a tube carried within the tube-holder *c*

and held therein by a set-screw $g$, which tube abuts against the cone $a$ and receives the strands from the grooves $b$ of said cone, the rope being laid or twisted within the tube $f$, contiguous to the cone, as the latter rotates with the flier.

A cradle 3 is journaled between each pair of flier-arms 6 6 and between each pair of heads or disks 7 $7^a$. The arms 6 are hollow or tubular and open through the heads or disks 7 $7^a$, and the strands 9 from certain of the bobbins 10 pass through the hollow journals 2 and $4^a$ and through these hollow arms 6, from whence they are conducted to the laying-top in the part 4. These hollow or tubular arms are a distinctive feature of my invention, and by their use the strands are protected at that part where they pass in line or parallel with a bobbin, so that if a strand should break during the operation of the machine it will be prevented from being wrapped around an arm 6 and a cradle 3, because the strand is confined within the arm 6 and cannot reach the cradle. This is an important advantage over the style of flier-arms as heretofore constructed and known to me, where the strands were conducted along and outside of a solid arm, and were thus unprotected adjacent to the cradle. The arms 6 may be secured to the heads or disks 7 $7^a$ in any suitable manner. I have shown said hollow arms as passing through apertures in said heads or disks and provided with collars $6^b$, which bear against the inner faces of said heads or disks, and with nuts $6^c$, threaded on the outer ends of said arms, to bear against the outer faces of said heads or disks. It will be seen from the section in Fig. 2 that the strand 9 (shown in dotted lines) passes from the hollow journals 2 and $4^a$ directly to and through the hollow arm 6. The strand from a bobbin 10 passes through the hollow journal $3^a$ of its cradle in well-known manner, and the strand from the bobbin 10 at the forward part of the machine passes direct to the laying-top in well-known manner. These hollow arms 6 are lighter in weight than an ordinary solid arm, and thereby enable the flier to be rotated at an increased speed. For convenience in passing the strands 9 through the hollow arms 6 the latter may be connected to the heads or disks 7 $7^a$ at one side of the connection of the arms 8 $8^a$ therewith, so that the latter arms will not interfere with free access to the open ends of the hollow arms 6 6. I have shown the arms 6 as located on the plane of a line perpendicular to a line passing through the arms 8 $8^a$, (see Fig. 3,) which position of the parts serves to equalize the distribution of the weight of the parts. The hollow arms 6 protect the strands 9 from the resistance of the air as the flier is rotated, and thus prevent the fibers from becoming ruffled.

I have shown a pulley 11 secured to the journal 4 at the forward end of the flier, whereby the power for rotating the flier is applied direct near the laying-top, where the greatest resistance occurs, instead of being transmitted throughout the length of the flier to the laying-top from a pulley at the rear of the flier, as has heretofore been customary.

In this class of fliers heretofore constructed as known to me the flier-arms were connected to radial arms that extended from the longitudinal axis of the flier, and as these radial arms rotated they would beat the air, thus creating a resistance and retarding the rotation of the flier. To reduce this air resistance, therefore, I provide the circular heads or disks 7 $7^a$, which during rotation will present less resisting-surfaces to the air, and thus enable the speed of rotation of the flier to be materially increased. The apertures in the heads or disks 7 $7^a$, into which the tubular arms project, permit the passage of the strands 9 from the hollow journal through said heads or disks. The centers of the heads or disks 7 $7^a$ serve as supports or bearings for the journals $3^a$ $3^b$ of the cradles 3, and for this purpose I have shown said heads or disks as provided with bosses $7^b$, in which are located suitable bushings 12, in which the journals $3^a$ $3^b$ of the cradles 3 are located. The bushings 12 may be held in place by set-screws 13, carried by the bosses $7^b$ or otherwise. Thus as the flier rotates the cradles will hang from the centers of the rotative heads or disks 7 $7^a$.

In order to reduce the length of the entire flier as much as possible without reducing the length of the bobbins, I recess or countersink the heads or disks 7 $7^a$ centrally, as at $7^c$, the radius of these recesses being sufficiently greater than the distance from the axis of the journals $3^a$ $3^b$ to the outer surface of the longitudinal arms or bars $3^c$ of the cradle to enable the vertical end arms $3^d$ $3^e$ of the cradle to enter said recesses. (See Fig. 1.) By this means the ends of the cradle are brought within the plane of the inner faces of the heads or disks 7 $7^a$, thus enabling the latter to be brought nearer together, while the heads or disks are permitted to rotate freely around said cradles. This shortening of the flier reduces its weight proportionately, thus enabling its speed of rotation to be increased.

Heretofore in this class of machines as known to me it has been customary to place a guide-roller between a pair of arms 8 8 and $8^a$ $8^a$ to receive the strand from the adjacent bobbin; but in this construction the passing of the strand over said roller did not have the desired effect upon the friction devices or brake that regulate the rotation of the bobbin as the strand was drawn therefrom. In my invention I connect a roller or whirl 14 with the friction devices for the bobbin 10, and for this purpose I have shown the following arrangement: The roller 14 is carried by a lever 15, that is pivotally supported by the cradle 3, as at $15^a$, the lever 15 serving to operate a brake-shoe 16, that acts against a friction-disk 17, connected with the bobbin 10 in well-known manner. (The bobbin 10 may be sup-

ported in the cradle 3 in well-known manner, as shown.) The lever 15 is moved to produce frictional contact between the parts 16 and 17 by means of a spring 18, which is shown acting against lever 15 and against the arm $3^d$ of the cradle, the arm $3^d$ for this purpose being shown extended above the journal $3^a$, a rod 19 being located within the coil of said spring 18, as shown in Fig. 1; but it is evident that the spring can be otherwise arranged, if desired. The roller or whirl 14 is adapted to have the strand 9 from the adjacent bobbin passed entirely around it, and the edge of said roller is so located that the strand therefrom will pass through the hollow journal $3^a$ of the cradle, as shown. With this arrangement as the strand is drawn from the bobbin it will cause the roller or whirl 14 to rotate, and as long as the strand feeds freely the friction devices will act on the bobbin in the ordinary manner; but if the bobbin should unduly resist the drawing of the strand or if the strand should not draw off freely from the bobbin the resistance thus produced would cause the strand that passes around the roller 14 to draw tightly thereon, whereupon the lever 15 will be pulled somewhat and the friction between the parts 16 17 will be relieved, whereupon the tension will be equalized and the bobbin will turn more freely. By this means the laying of the strands of the rope will be more even and uniform than would be the case if there were no means provided to regulate the frictional resistance of the friction devices or brake for the bobbin.

The hollow arms 6 could be otherwise connected with the hollow journals than by the circular heads or disks—as, for instance, by the ordinary cross-heads.

I do not limit my invention to the precise details of construction shown and described, as they may be varied without departing from the spirit of my invention.

Having now described my invention, what I claim is—

1. In a rope-laying flier, the combination of three hollow journals, with hollow or tubular flier-arms on opposite sides of the intermediate hollow journal, means detachably connecting said intermediate journal with said hollow arms, means detachably connecting the hollow journals at the ends of the flier with the respective hollow arms, said hollow arms opening through the means that connect them with the journals, a laying-top connected with the forward hollow journal, and means for supporting bobbins in the flier, substantially as described.

2. In a rope-laying flier, the combination of a hollow or perforated journal, and arms $8^a$ projecting therefrom, with circular heads or disks connected with said arms, hollow or tubular flier-arms connected with and opening through said heads or disks, and other circular heads or disks connected with the opposite ends of said hollow arms, said arms opening through said last-mentioned heads or disks, hollow journals connected with the last-mentioned heads or disks, means for supporting bobbins in the flier, and a laying-top connected with the forward journal, substantially as described.

3. In a flier, the combination of a hollow journal, arms $8^a$ projecting therefrom, a head between said arms and detachably connected therewith, a hollow journal at the end of the flier, hollow flier-arms, a head connected with the last-mentioned journal and with said flier-arms, said flier-arms opening through said heads, substantially as set forth.

4. In a flier, the combination of a hollow journal, arms $8^a$ carried thereby and projecting outwardly therefrom on opposite sides, a head interposed between each pair of said arms and detachably connected therewith, hollow journals on opposite sides of the central journal, arms 8 carried by the last-mentioned journals, a head detachably connecting each pair of arms 8, and hollow flier-arms interposed between a pair of heads and opening through the heads, the flier-arms being detachably connected with the corresponding heads, substantially as described.

WILLIAM C. BOONE.

Witnesses:
T. F. BOURNE,
S. B. MORSS.