J. F. STRUBLE.

HYDRAULIC PROPELLER.

APPLICATION FILED FEB. 3, 1910.

1,024,376.

Patented Apr. 23, 1912.

2 SHEETS—SHEET 1.

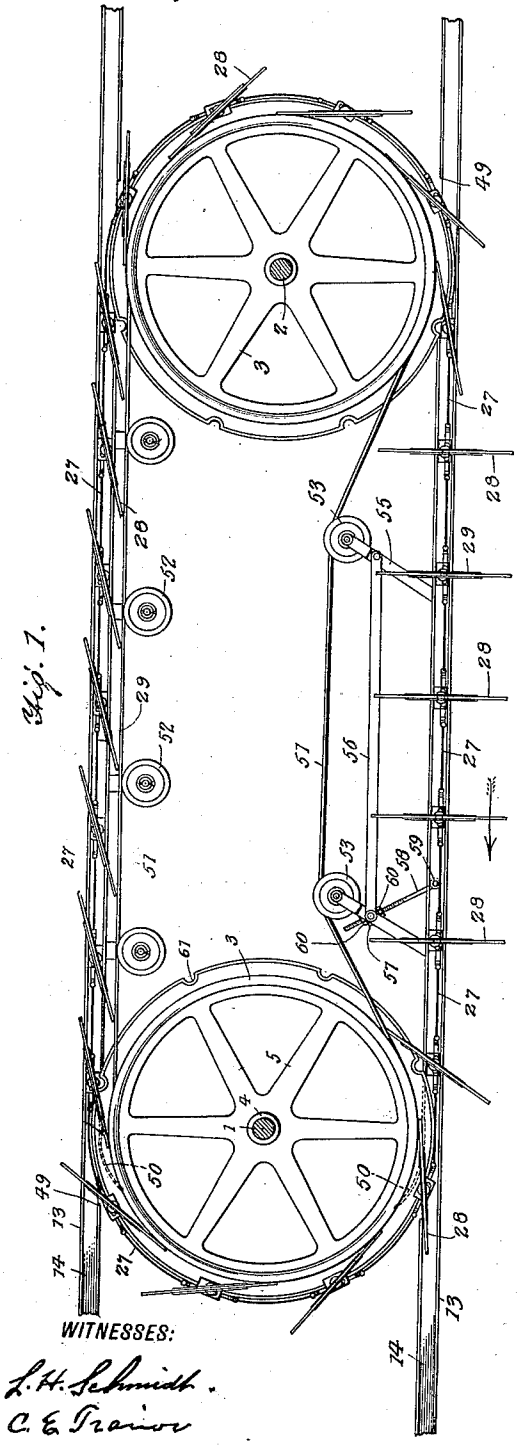

Fig. 1.

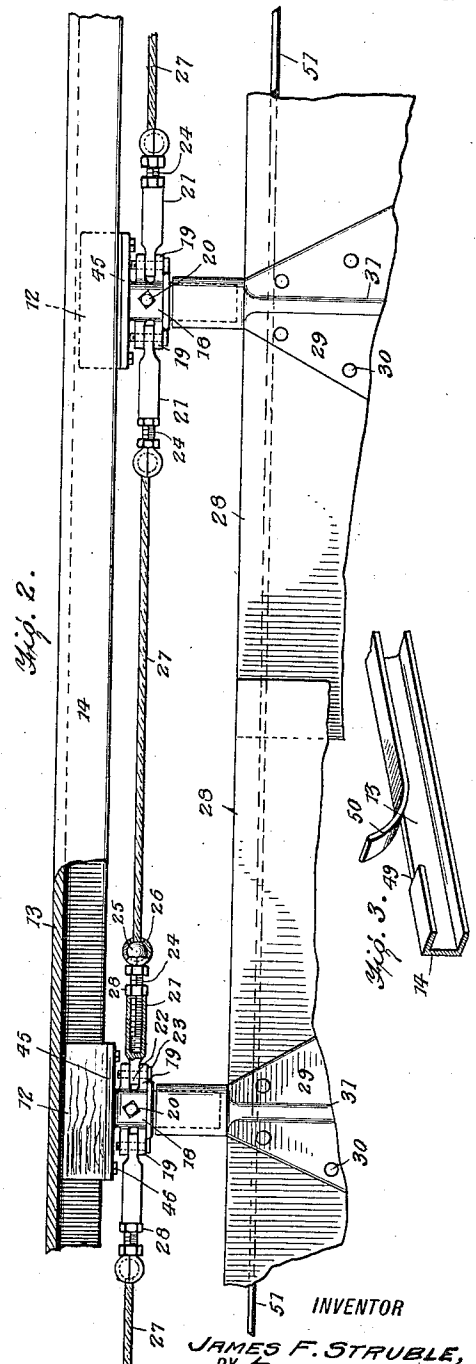

Fig. 2.

Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 4.

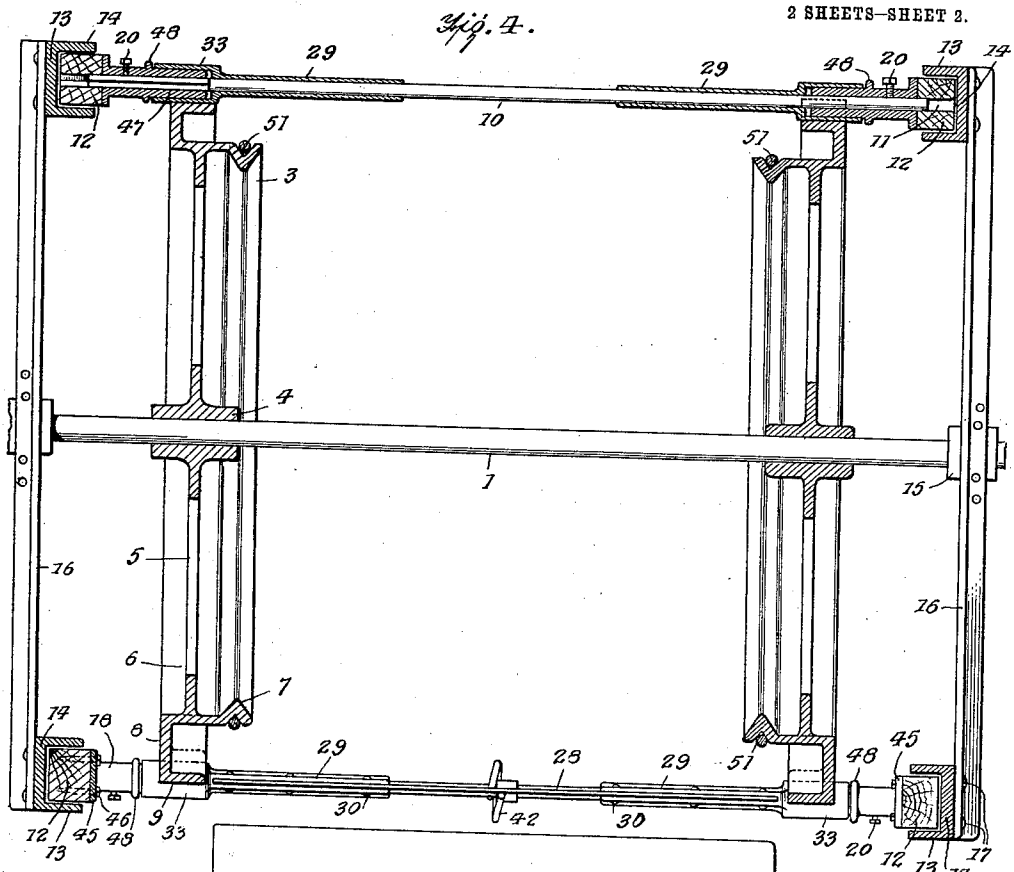


Fig. 5.

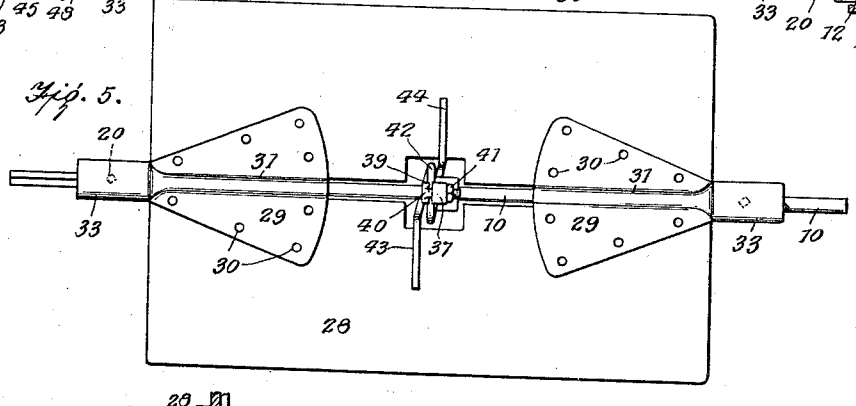


Fig. 6.

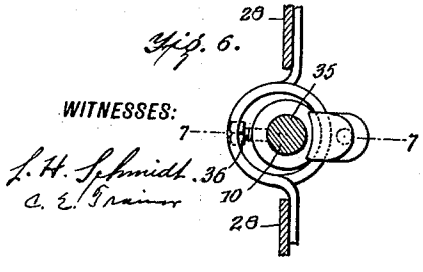
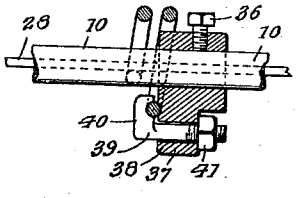


Fig. 7.



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HYDRAULIC PROPELLER.

1,024,376. Specification of Letters Patent. Patented Apr. 23, 1912.

Application filed February 3, 1910. Serial No. 541,698.

To all whom it may concern:

Be it known that I, JAMES F. STRUBLE, a citizen of the United States, and a resident of Hanston, in the county of Hodgeman and State of Kansas, have made certain new and useful Improvements in Hydraulic Propellers, of which the following is a specification.

My invention is an improvement in hydraulic propellers and consists in certain novel constructions and combinations of parts, hereinafter described and claimed.

The object of the invention is to provide a propeller of the character specified, especially adapted for use in running streams, of simple and cheap construction, wherein the blades, against which the water acts, will be automatically moved into a position perpendicular to the direction of movement of the current as they enter the water, and retained in this position until they are leaving the water, and will then be moved into a position substantially parallel with the direction of movement of the water.

Referring to the drawings forming a part hereof, Figure 1 is a side view of the improvement, Fig. 2 is an enlarged plan view of a portion of the same, Fig. 3 is a perspective view of a section of the track, Fig. 4 is a transverse vertical section on the line of one of the shafts, Fig. 5 is a front view of a blade or vane, Fig. 6 is a central transverse section of a portion of a blade, and Fig. 7 is a section on the line 7—7 of Fig. 6.

The embodiment of the invention shown in the drawings comprises an endless carrier provided with vanes, and supported by spaced shafts 1 and 2, arranged parallel with each other and supported in any suitable manner, each shaft having secured thereto, near its ends, wheels 3, each comprising a hub 4 on the shaft, and a rim 6 connected to the hub by spokes 5.

The rim 6 of each wheel is provided on its periphery, near one edge, with an annular V-shaped groove 7, and at the other edge with a marginal outwardly extending web 8 provided at its outer edge with an overlying flange 9, substantially parallel with the outer face of the rim of the wheel. An endless cable to be presently described in detail runs on the flanges of the corresponding wheels at each end of the shafts, and the cables are connected, at spaced intervals, by rods 10, the ends of the rods extending beyond the wheels as shown in Fig. 4. Each rod at its ends extends into openings 11, in blocks 12, of wood or other suitable material, which move in the channels 13, of channel bars 14 supported on each side of the propeller proper, and at the top and bottom of the wheels. The shafts 1 and 2 are also extended beyond the wheels as shown in Fig. 4 and are journaled in bearings 15, on vertical bars 16, to the ends of which the channel bars 14 are connected, by bolts or rivets 17. The channel bars 14 extend beyond the shafts 1 and 2, and with the bars 16 form a frame in which the propeller is supported, and the said frame may be supported in a stream in any suitable manner, preferably with the lower run of the carrier, formed by the cables and rods, immersed.

The cables as shown in Fig. 2, are composed of bearing blocks 18, through which the rods 10 pass, the bearing blocks being inside of the guide blocks 12, and each bearing block is provided at its ends with spaced ears 19. Set screws 20 are passed through the bearing blocks and engage the rods to retain them in place, and a threaded socket 21 is provided with a lug 22, which is received between a pair of ears, and held by a bolt 23, passing through the ears and the lug. The socket is engaged by a threaded stem 24, having at its outer end a socket 25, in which is received the ball 26 of a link 27 of flexible material, connecting the threaded stem with the corresponding stem of the adjacent rod 10. The stem is locked by lock nuts 28, and each of the bearing blocks is connected in a similar manner to the adjacent blocks. Wear may be compensated for by screwing the stems in or out of the sockets, and the rods 10 may be adjusted into proper parallelism and retained in such condition by the mechanism just described.

Should it be necessary for any reason to remove a rod, it may be easily accomplished by removing the stems on each side. The turning movement necessary is permitted by the ball and socket joint, which also acts as a universal joint on each side of the bear-

ing block. The stem 24 is composed of similar half sections, as indicated in Fig. 2, the division extending through the socket 25, so that when the stem is disengaged from the socket 21, the sections may be separated to release the ball.

A vane or blade 28 is held on each rod 10, by means of substantially fan shaped plates 29, each blade consisting of two sections, one arranged above and the other below the rod, and connected by the plates 29. The plates are arranged in pairs, one pair at each end of the blade, the members of the pairs being on opposite sides of the blades. The plates extend across the space between the sections, and at the said space, each plate is provided with a groove 31, which coöperates with the groove of the other member of the pair to form a recess in which the rod is seated. The members of each pair of plates are secured together by rivets 30, extending through the blade, and each plate is provided at its outer end with a section of a collar 33, which coöperates with the section of the other plate to form a complete collar encircling the rod. At the center of the edge adjacent to the rod, each blade section is notched as at 34, the notches registering, and a sleeve 35 is secured to the rod, in the notches, by a set screw 36. The sleeve is provided with a radial lug 37, through which is an opening 38, and a stem 39 provided at one end with a hook 40 is passed through the opening, the opposite end of the stem being threaded, and engaged by a nut 41. A spring 42 is coiled once around the rod, and the ends 43 and 44 of the spring engage the sections of the blade, as shown in Figs. 5 and 6. The coil of the spring is engaged by the hook as shown in Fig. 7, and held closely against the collar, and the spring acts normally to retain the blade perpendicular to the face of the carrier.

As shown in Fig. 4, each of the bearing blocks 18 is provided at the outer end of the bearing portion with an annular rib 45, which abuts against the guide block 12, and is secured thereto by screws 46, and at its inner end the bearing block is provided with a hub portion 47, extending into the collar 33 of the blocks, the block having an annular rib 48 which abuts against the end of the collar. One end of the rod is square in cross section as shown at 10^a in Fig. 4, the bearing block and guide block having square openings to fit the same. The guide blocks 12 move in the channels 13 of the channel bars, and at the point where the rods and blocks leave the channels to pass around the wheels, the one flange of the bar is slotted transversely as at 49, and turned inwardly to form a lip 50 (Fig. 3) to permit the block to pass to or from the channel.

As before mentioned, the springs 42 normally hold the blades perpendicular to the face of the carrier, or in vertical position. In the grooves 7 of the wheels, endless cables 51 run, one cable being arranged on each side of the propeller, and the cables are supported intermediate the wheels, on the upper run by grooved rollers 52, and on the lower run by similar rollers 53. The rollers 52 are journaled on arms 54 connected with the channel bars, and extending inwardly, and each of the lower rollers is journaled on the one end of a lever 55, whose other end is pivoted to the frame. The levers 55 are connected by a link 56, and a sleeve 57 is pivoted to one of the levers, through which is passed a threaded rod 58. The rod is pivoted at its lower end to the frame as at 59, and is engaged above and below the sleeve, by nuts 60.

The web 8 and flange 9 of the wheel support the carrier in spaced relation from the periphery of the wheel, and the upper rollers 52 are arranged with their upper sides substantially flush with the upper sides of the wheels, and the engagement of the lower edges of the blades with the cables, holds the blades in a substantially longitudinal position, so that they offer but slight resistance to the air or water. As the blades pass around the wheels, the peripheral surfaces of the wheels and the flanges 9 hold them in the same position. On the lower run of the carrier, the cables are elevated out of engagement with the blades, and the springs 42 immediately swing the blades in to a vertical position, and retain them in such position until the edge of the blade again engages the periphery of the wheels. The rollers 53 may be lowered or raised by turning the nuts 60, the link 56 causing the levers to move simultaneously. The engagement of the guide blocks with the channel bars prevents lifting of the cables forming the carrier, and compels the blades to move in a straight line, thus converting the full force of the current into forward motion. The web 8 and the flange 9 are notched at suitable intervals as shown at 61 to receive the rods 10, and the open spaces at the ends of the carrier, that is the discontinuance of the channel bars around the wheels, dispense with considerable friction, since at this point the guide blocks move freely.

In operation, the propeller being supported in the position shown in Fig. 1 in a suitable current, the force of the current acts against the blades, which are vertical, and moves them longitudinally of the frame in the direction of the arrow. As the upper edge of each blade strikes the peripheries of the wheels on the shaft 1, the blade swings against the resistance of the spring, and gradually takes a horizontal position. As it passes around the wheels, the lower

edge comes uppermost, and the blade passes out of the water in an inclined position, which offers the least resistance to the water. On the upper run of the carrier, the blades are held in the position shown, and at the end of the carrier adjacent to the shaft 2, they pass into the water edge first, offering a minimum of resistance. As soon as the upper edge of the blade passes from the wheel the spring immediately throws it into vertical position. It will be evident from a consideration of the positions assumed by the blade, and shown in Fig. 1, that during the active stage of the travel of each blade it is in vertical position, that it assumes the position in the shortest possible space of time after entering the water, and that at all other times it is in a position offering but slight resistance to its travel.

The mechanism is, while very simple, very efficient for the purpose, and requires no attention after being started. The operation of feathering the blades is entirely automatic, and the natural and normal position of each blade is vertical. The different parts are easily accessible for repairs and replacements, and the entire device while developing a great amount of power is of light weight in proportion to the power developed. Each blade is quickly thrown into vertical position as soon as it engages the water, while on leaving the water the swinging of the blade is gradual, thus preventing injury to the blade or spring.

In the actual use of the device, the lower run of the cable 51 would occupy a position, such that the edge of the vane would engage the cable before engaging the periphery of the wheel, in order to cushion the vane against jar, and the rope should be of a size sufficient to fill the groove in the wheels, and extend thereabove for the same reason. That is, the cable should be so arranged that the edge of the vane does not at any time engage the wheel directly.

It will be understood that the operation of the device is precisely the same in either direction, and that it is immaterial which end is placed upstream.

I claim:

1. A device of the class described comprising a frame composed of upper and lower oppositely arranged sets of channel bars, an upright connecting the ends of the bars at each side, a shaft journaled transversely of the frame in each pair of uprights, a wheel near each end of each shaft, each wheel having a groove on the inner edge of its periphery, and an overlying flange on the outer edge spaced apart from the periphery, an endless carrier supported on the wheels and comprising a plurality of transverse parallel rods, a bearing block at each end of each rod, and in which the rod is journaled, a threaded socket pivoted to each end of each block, a stem threaded into each socket and having at its outer end a socket, said stem being divided longitudinally into similar sections, and a link provided at each end with a ball received in the sockets of adjacent stems, a vane journaled by its longitudinal center on each rod, a spring normally retaining the vane in vertical position, guide blocks on the ends of each rod and moving in the channels of the channel bars, said bars being slotted to permit the entrance and exit of the blocks, cables running in the grooves of the wheels, and engaging the edges of the vanes to hold them in substantially horizontal position against the resistance of the springs, rollers engaging the lower runs of the cables, and holding them out of engagement with the blades, and means for raising and lowering the rollers.

2. In a device of the class described, an endless carrier comprising parallel rods spaced apart from each other, guide blocks on the ends of the rods, guides in which the blocks move, vanes journaled by their longitudinal centers on the rods, a spring normally retaining each blade in vertical postion, a flexible connection between the rods at each end, wheels for supporting the carrier over which the rods move, cables running on the wheels and normally holding the blades in substantially horizontal position, rollers engaging the lower runs of the cables and holding them out of engaging position with the vanes, and means for simultaneously raising and lowering the rollers.

3. In a device of the class described, an endless carrier comprising parallel rods spaced apart from each other, guide blocks on the ends of the rods, guides in which the blocks move, vanes journaled by their longitudinal centers on the rods, a spring normally retaining each blade in vertical position, a flexible connection between the rods at each end, wheels for supporting the carrier over which the rods move, cables running over the wheels and engaging the edges of the blades to hold them in substantially horizontal position, and rollers engaging the lower runs of the cables, and holding them out of engagement with the blades.

4. In a device of the class described, an endless carrier comprising parallel rods spaced apart from each other, guide blocks on the ends of the rods, guides in which the blocks move, vanes journaled by their longitudinal centers on the rods, a spring normally retaining each blade in vertical position, a flexible connection between the rods at each end, wheels for supporting the carrier over which the rods move, cables running on the wheels and engaging the vanes to hold them in substantially horizontal position, and means for holding the lower runs

of the cables out of engagement with the blades.

5. In a device of the class described, an endless carrier comprising spaced substantially parallel rods, vanes on the rods, bearing blocks at the ends of the rods in which the rods are journaled, a threaded socket pivoted to each end of each block, a stem threaded into each socket, and provided at its outer end with a socket, said stem being divided longitudinally into similar sections, and a flexible strand at each end with a ball received in the socket of a stem for connecting adjacent bearing blocks.

6. In a device of the class described an endless carrier comprising spaced substantially parallel rods, vanes on the rods, bearing blocks at the ends of the rods, in which the rods are journaled, a threaded socket pivoted to each end of each block, a stem threaded into each socket, and provided at its outer end with a socket, and a flexible strand provided at each end with a ball received in the socket of a stem, for connecting adjacent blocks.

7. In a device of the class described, an endless carrier comprising spaced substantially parallel rods, vanes on the rods, bearing blocks at the ends of the rods, in which the rods are journaled, a threaded socket pivoted to each end of each block, a stem threaded into each socket, and flexible strand having a universal joint connection at each end with adjacent stems.

8. In a device of the class described, an endless carrier comprising spaced substantially parallel rods, vanes on the rods, bearing blocks at the ends of the rods in which the rods are journaled, a threaded socket pivoted to each end of each block, a stem threaded into each socket, and a flexible connection between adjacent stems.

9. In a device of the class described, a sectional vane, a rod arranged between the sections, plates connecting the sections and grooved to receive the rod, bearings for the rod on the plate outside of the vane, said sections being notched adjacent to the rod, and near the center, a sleeve on the rod in the notches, a spring encircling the rod, each end of the spring engaging a vane section, and a hook detachably connected with the sleeve and engaging the spring to hold it in place.

10. In a device of the class described, a sectional vane, a rod arranged between the sections, plates connecting the sections and grooves to receive the rod, bearings for the rod on the plate outside of the vane and a spring secured to the rod and engaging the vane to hold it in vertical position.

11. In a device of the class described, a plurality of sectional vanes, a rod arranged between the sections of each vane, and extending beyond the vane, plates connecting the sections and grooved to receive the rod, said plates having bearings for the rod beyond the edges of the vane, and a flexible connection between the ends of adjacent rods.

12. In a device of the class described, a carrier comprising spaced parallel endless cables, rods arranged transversely and connecting the cables at spaced intervals, a vane on each rod, and means between each pair of rods for independently expanding or contracting either cable.

13. In a device of the class described, a carrier comprising spaced substantially parallel rods, a vane on each rod, a connection between the adjacent ends of the rods, and means for independently expanding or contracting each of the said connections.

14. In a device of the class described, an endless carrier, vanes at spaced intervals on the carrier, a spring normally holding each vane in vertical position, a cable engaging the edges of the vanes for swinging them into substantially horizontal position against the resistance of the springs, levers pivoted by one end adjacent to the lower run of the cable, a roller journaled on the other end of each lever, a link connecting the levers, a sleeve pivoted on one lever, a threaded rod pivoted at one end and passing through the sleeve, and a nut on the rod.

15. In a device of the class described, an endless carrier, vanes at spaced intervals on the carrier, a spring normally holding each vane in vertical position, a cable engaging the edges of the vanes for swinging them into substantially horizontal position against the resistance of the springs, rollers engaging the lower run of the cable, levers on which the rollers are journaled, a link connecting the levers, and means engaging one of the levers for swinging the same, and retaining it in adjusted position.

16. In a device of the class described, an endless carrier, vanes at spaced intervals on the carrier, a spring normally holding each vane in vertical position, a cable engaging the edges of the vanes for swinging them into substantially horizontal position against the resistance of the springs, rollers engaging the lower run of the cable, and means for simultaneously raising or lowering the rollers.

17. In a device of the class described, an endless carrier, vanes at spaced intervals on the carrier, a spring normally holding each vane in vertical position, a cable engaging the edges of the vanes for swinging them into substantially horizontal position against the resistance of the springs, and adjustable means for holding the lower run of the cable out of contact with the blades.

18. In a device of the class described, an

endless carrier comprising spaced cables, each consisting of a plurality of cable sections, rods arranged transversely of the cables, a bearing for each end of each rod, a socket pivoted to each side of each bearing, a stem threaded into each socket and provided at its outer end with a socket, the cable sections having at each end a ball for engaging the socket.

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Witnesses:
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