Jan. 26, 1926. 1,571,157

E. G. McCALL

ASSEMBLING APPARATUS

Filed March 6, 1924 3 Sheets-Sheet 1

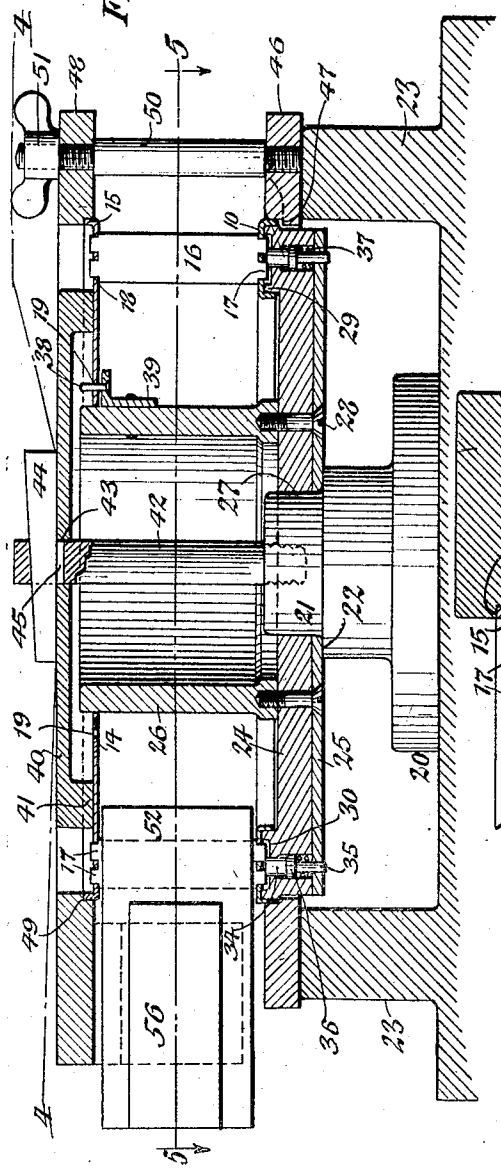


Fig. 1.

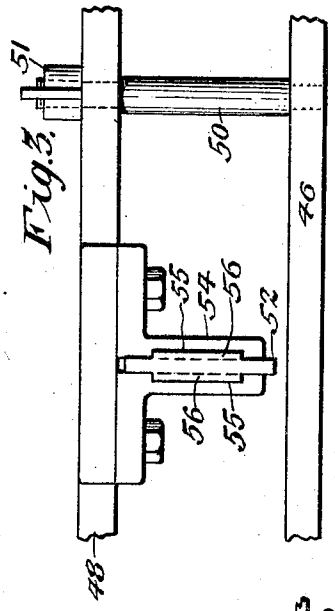


Fig. 3.

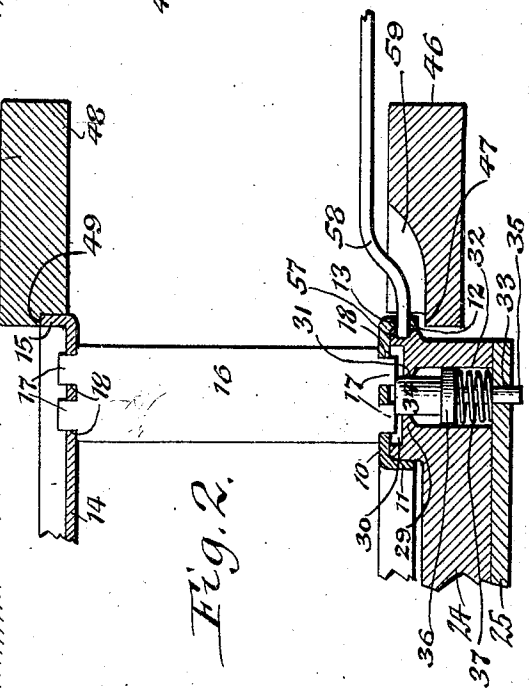


Fig. 2.

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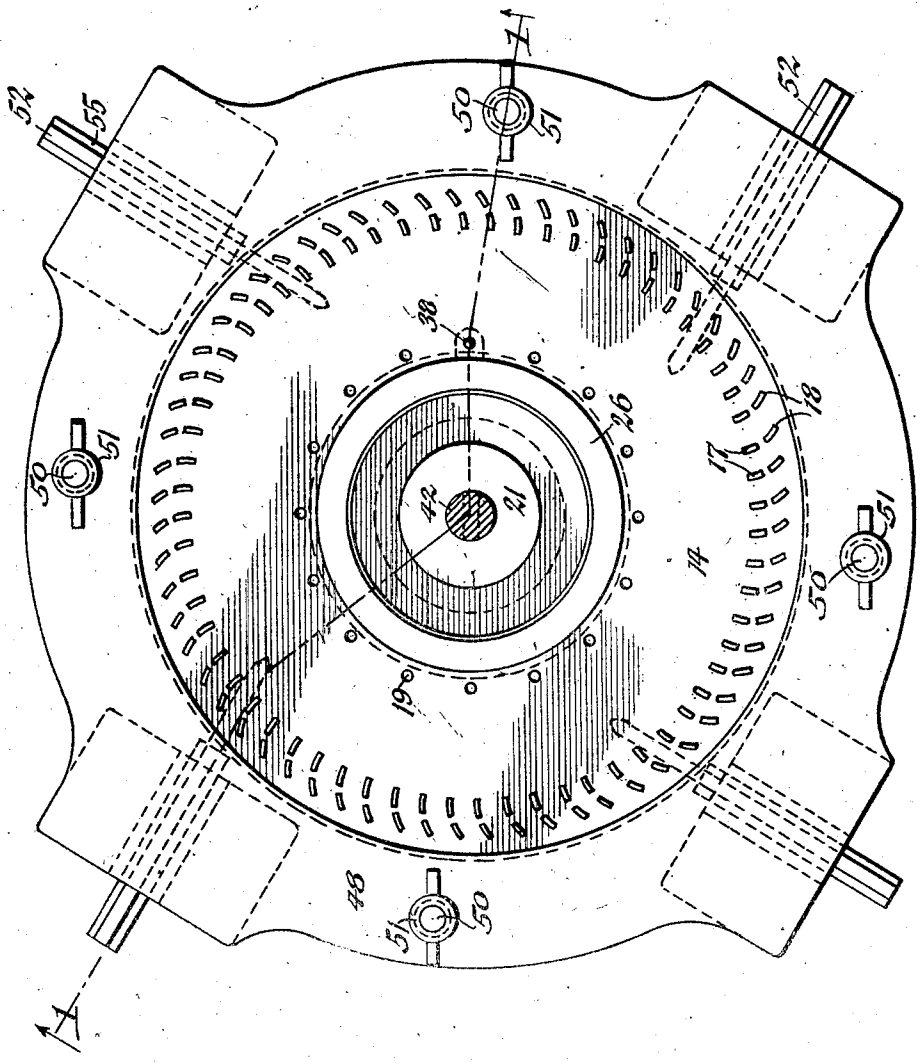
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Fig. 4.



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ASSEMBLING APPARATUS

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Fig. 5.

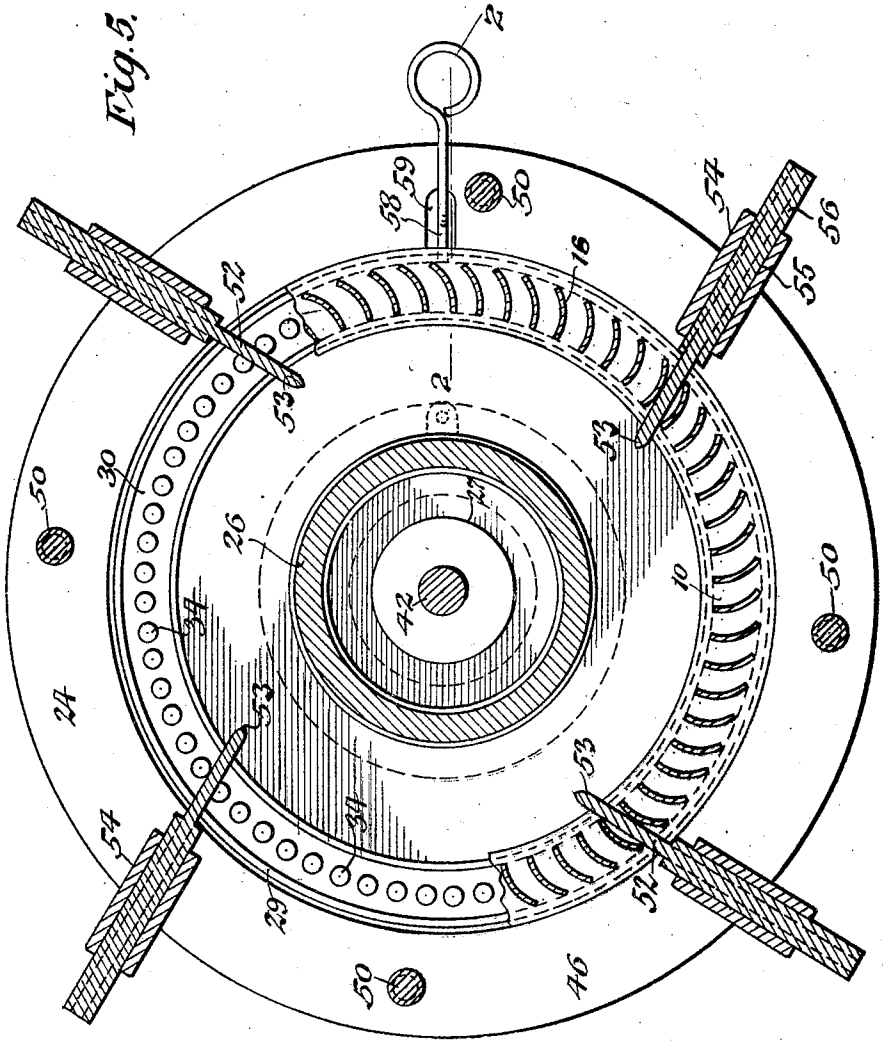
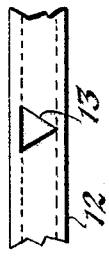


Fig. 6.



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Patented Jan. 26, 1926. 1,571,157

UNITED STATES PATENT OFFICE.

EUGENE G. McCALL, OF BUFFALO, NEW YORK.

ASSEMBLING APPARATUS.

Application filed March 6, 1924. Serial No. 697,306.

To all whom it may concern:

Be it known that I, EUGENE G. McCALL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Assembling Apparatus, of which the following is a specification.

This invention relates to an apparatus for use in assembling the impellers, rotors or wheels of rotary fans or blowers and to hold the several parts temporarily in their proper relative position until the same have been securely and permanently connected with each other by riveting, spot-welding or otherwise.

These fan wheels or impellers consist generally of a disk and ring, similar annular side members arranged side by side and an annular row of wings, vanes or blades arranged transversely between the disk and ring and each having its opposite ends provided with tongues or tenons which are secured in corresponding openings in the disk and ring. Considerable difficulty has been experienced heretofore in assembling the members of these fan wheels preparatory to securing them together owing to the fact that after a few blades have been mounted between the disk and ring the subsequent mounting of further blades causes some of the previously mounted blades to be thrown out, thereby necessitating doing much of the work over again and involving loss of time and increasing the cost of doing this work accordingly.

It is the object of this invention to provide an apparatus whereby the assembling of the blades with the disk and ring, or side members of a fan, impeller or wheel can be effected easily, conveniently, expeditiously and accurately without liability of any of the blades slipping out of place after being once seated where they belong and thereby not only facilitate the building of these wheels, but also reducing their cost of manufacture.

In the accompanying drawings:

Figure 1 is a vertical section of an assembling apparatus embodying a suitable form of my invention and showing the parts of a fan wheel assembled therein, the section being taken on line 1—1, Figure 4. Figure 2 is a fragmentary vertical section, on an enlarged scale, taken on line 2—2, Figure 5. Figure 3 is a fragmentary side elevation of the assembling apparatus containing my invention. Figures 4 and 5 are horizontal sections taken on the correspondingly numbered lines in Figure 1. Figure 6 is a fragmentary edge view of the ring of the impeller.

Similar characters of reference indicate like parts in the several figures.

Although this assembling apparatus is primarily intended for holding together the several parts of a fan wheel or impeller, it is to be understood that the same is also useful for assembling other objects of similar construction which present like conditions. The fan impeller shown in the drawings is therefore to be merely regarded as an example of one article capable of being readily assembled by the use of my invention. This impeller, as shown in the drawings, comprises a lower ring, an upper disk, and a plurality of blades, wings or vanes arranged between the ring and disk. The lower ring comprises a web 10, the plane of which is parallel with a line radiating from the axis of the ring and inner and outer annular flanges 11 and 12 projecting laterally from the inner and outer edges of this ring. The upper disk comprises a web 14 which is flat and arranged parallel with a line radiating from the axis of this disk and an outer annular flange 15 projecting laterally from the outer edge of web 14. This ring and disk are arranged concentrically side by side and in the space between the same is arranged an annular row of transverse blades, wings or vanes each of which has a body 16 which is curved about an axis arranged parallel with the axis of said ring and disk and has a convex front side and a concave rear side. Each of these blades is provided at its opposite ends with a pair of tongues or tenons 17 which engage with corresponding openings 18 in the webs of the ring and disk so that the ends of the blade body engage with the opposing inner sides of said webs. The blades are secured to these webs by riveting the outer ends of the tongues over against the outer side of the webs, or by spot-welding or otherwise treating the same so that the blades cannot become detached from the ring and disk. In its outer flange the ring is provided with a sight opening 13, preferably of triangular form, as shown in Figure 6, and adjacent to its inner edges the web of the disk is provided with an annular

row of coupling openings 19, said sight opening being used to facilitate assembling of this impeller with other parts and said coupling openings being desired to receive rivets, bolts, screws or the like for attaching the impeller to the hub of a shaft whereby the impeller is rotated within an appropriate housing or enclosing casing.

The assembling apparatus forming the subject of this invention is designed to permit of easily and reliably assembling the ring, disk and blades of the impeller in their proper relative position preparatory to rigidly uniting them by riveting, soldering, welding or otherwise securing the tongues of the blades in the blade openings of the ring and disk. In its preferred form this assembling apparatus, as shown in the drawings is constructed as follows:

The numeral 20 represents a bed or base which is provided on its central part with an upwardly projecting reduced post 21 forming an upwardly facing shoulder 22, and a plurality of supporting arms 23 projecting upwardly from the base at a distance from the central post. Upon the post is mounted a supporting head which comprises a lower supporting plate composed of upper and lower sections 24, 25 and a cylindrical hub 26 rising from the central part of this plate. The latter is provided with a central opening 27 which receives the post 21 and rests on the shoulder 22 and the two parts of the lower plate and the hub are detachably connected by screws 28, as shown in Figure 1. On the upper side of its marginal part the supporting plate is provided with an annular rim 29, the upper side of which is provided with an annular channel 30. During the assembling of the impeller the ring thereof is mounted on this rim so that its flanges engage the inner and outer sides thereof. and the tongues at the lower ends of the blades project into the channel of the rim. In the marginal part of the upper section 24 of the supporting plate the same is provided with an annular row of upright openings the upper part 31 of each being of small diameter and forming an upper guide and the lower part 32 being of larger diameter and forming a pocket, and the adjacent part of the lower section of the supporting plate being provided with a lower guide opening 33 of comparatively small diameter.

A plurality of upright tension pins are mounted in an annular row on the marginal part of the lower supporting plate and are adapted to exert an upward pressure on the blades during the operation of assembling the parts of the fan impeller. Each of these pins has a reduced upper part 34 guided in one of the guide openings 31, a reduced lower part 35 guided in the companion guide opening 33, and an enlarged collar or central part 36 arranged in the respective pocket 32. Each of these tension pins is yieldingly held in its elevated position so that its upper end normally is arranged above the bottom of the channel 30 by means of a spring 37 arranged in the pocket around the tension pin and bearing at its upper end against the collar of the pin and at its lower end against the bottom of the pocket, as shown in Figure 1.

On one part of the upper end of the periphery of the hub the same is provided with an upwardly projecting locating or gage pin 38 which is preferably connected therewith by a bracket 39, this pin being adapted to engage with one of the coupling openings 19 in the disk, these openings being utilized as gage openings during assembling and uniting of the impeller members.

The numeral 40 represents an upper pressure plate whereby a downward pressure is exerted against the disk of the impeller while the same is engaged with the gage pin 38 and its blade openings are being engaged with the tongues or tenons at the upper ends of the blades. The tension plate is preferably constructed of circular form and extends over the hub and is provided on its margin with a depending annular bearing rim 41 adapted to engage with the upper side of the disk between the gage openings and the blade openings at the inner and outer edges thereof. The pressure plate is held in place and caused to bear with gradually increasing pressure against the upper side of the impeller disk during the assembling operation by means which preferably consist of an upright pressure rod 42 arranged within the hub of the supporting head and connected at its lower end to the upper end of the post while its upper part extends through a central opening 43, in the plate 40, and a wedge 44 engaging with the top of the pressure plate and passing through an opening 45 in the upper end of the pressure rod.

Clamping means are provided for securely holding the several parts of the impeller in place after being assembled and in such manner that the tongues of the blades are accessible on the outer sides of the ring and disk and thus permit of riveting, spot-welding or otherwise treating them for permanently connecting the blades with the disk and ring. In the preferred form of these holding means the same comprise a lower clamping ring 46 adapted to surround the supporting plate above the supporting arms and provided on its inner edge with an upwardly facing annular shoulder 47 adapted to engage the outer flange of the impeller ring, an upper clamping ring 48 provided on its inner edge with a downwardly facing shoulder 49 adapted to engage with the upper edge of the outer flange on the impeller

disk, and means for detachably connecting the lower and upper clamping rings consisting preferably of a plurality of upright tie rods 50 each permanently secured at one end to one of the clamping rings and detachably connected at its opposite end with the other clamping ring. In the preferred construction each of these rods is secured at its lower end to the lower clamping ring and has its upper end passing through an opening in the upper clamping ring and provided with a wing nut 51 engaging with the top of the upper clamping ring.

For the purpose of alining the several blades and causing them to stand perfectly erect and at right angles to the impeller ring and disk before the clamping rings are tightened on the disk and ring and to hold them in place while the tongues on the ends of the blades are being riveted or spot-welded alining means are provided which preferably are constructed as follows:

The numeral 52 represents a plurality of alining plates, preferably four in number and arranged equidistant in the annular space between the upper and lower clamping rings and around the annular row of impeller blades. Each of these alining plates is arranged with its flat sides vertical and is movable inwardly and outwardly relatively to the axis of the impeller for the purpose of engaging the same with opposing surfaces of two adjacent blades as well as disengaging the same therefrom. To facilitate the entrance of each alining plate between two blades the front end of the same is sharpened somewhat as shown at 53. Each of the alining plates is guided during its movement by means of a bracket 54 secured to the underside of the upper clamping ring and provided with a guideway 55 which receives guiding ribs 56 on opposite sides of the respective alining plate. The path for each alining plate formed between the center of the convex side of one blade and the opposite edges of the concave side of the adjacent blade is tangential to the axis of the impeller and the guides on the brackets for the alining plates are therefore arranged on correspondingly tangential lines, as shown in Figure 5.

On the periphery of the upper section of the supporting plate, the same is provided at one point with a locking or gaging recess 57 opposite which the sight opening 13 in the outer flange of the impeller ring is to be placed for lining up this relative to the impeller disk so that the corresponding blade openings in the ring and disk are vertically in line with each other. The impeller ring is held in this position during the operation of assembling the several parts of the same by means of a locking pin 58 which is passed through the sight opening 13 and the locking recess 57, access to this opening and recess being afforded by providing the lower clamping ring with a cavity 59 on the upper side of its inner edge which furnishes the necessary clearance for this purpose, as shown in Figures 2 and 5.

The operation of setting up a fan impeller by the use of this assembling apparatus is briefly as follows:

While the supporting head is resting on the post, the operator places the lower clamping ring upon the supporting arms 23 so that it surrounds the upper section of the lower supporting plate. The ring of the fan impeller is now placed upon the rim of the supporting plate so that its flanges project downwardly on the inner and outer sides of this rim and the outer flange overhangs the upwardly facing shoulder of the lower clamping ring. The fan ring is adjusted circumferentially on the lower supporting plate until its sight opening registers with the locking recess of this plate and then these parts are held in this relative position by passing the locking pin through this sight opening and into this recess. The fan blades are now erected loosely on the lower ring by engaging the blade openings of the latter with the tongues on the lower ends of the blades, each pair of these openings at this time being over one of the tension pins on the lower supporting plate. Owing to these pins at this time being yieldingly held in their uppermost position by the springs associated therewith the tongues of the blades do not fully enter the blade openings so that the blades are supported slightly above the normal position which they will eventually occupy in the proper assembled position. The disk of the impeller is now placed loosely around the upper end of the hub and over the upper ends of the blades and one of its coupling openings is utilized as a gage or alining opening and engaged with the upper gage pin for holding the disk in a definite position against circumferential displacement. Next the pressure plate is applied to the upper side of the fan disk and over the pressure rod and the pressure wedge is driven through this pin sufficiently tight to produce a slight downward pressure on the upper fan disk and the blades so that the spring pressed tension pins under the latter will be depressed. The operator now tilts the blades one at a time in the proper direction to bring the upper tongues thereof into line with the corresponding blade openings in the fan disk and after thus alining the blade the same will be instantly raised by its tension pin so that its upper tongues will enter the respective blade openings and become interlocked therewith against lateral displacement. This operation is repeated successively upon each blade and as each in turn snaps into place the operator tightens the wedge a little more and thus moves the pres-

sure plate downwardly further in the same measure as the interlocking of the tongues at the upper ends of the blades with the upper fan disk progresses. After interlocking all of the blades with the upper fan disk in this manner the upper clamping ring is placed around the upper disk and the downwardly facing shoulder of this ring is engaged with the outer flange of the upper fan disk and this ring is loosely secured to the upper ends of the tie rods. The alining plates are now pushed inwardly so that each passes into engagement with the two blades thereby straightening up the entire circular row of blades inasmuch as the fan disk causes the several blades to move circumferentially in unison. The two clamping rings are drawn together tightly so that they engage the outer flanges of the fan ring and disk and hold them firmly in engagement with opposite ends of the blades and produce one rigid mass. After the impeller has been thus placed within the grip of the clamping device the pressure plate is removed from the top of the fan disk and the pressure rod, thereby permitting the lower fan ring, the upper fan disk and the intermediate fan blades to be removed in a properly assembled position together with the clamping device and then presented to means whereby the outer ends of the tongues are either upset or riveted, soldered, spot-welded, or otherwise acted upon to produce a permanent connection between the blades and the ring and disk, thereby completing the operation and permitting the clamping device to be removed for use in repeating this operation in the manner described.

It will be apparent that this apparatus avoids the difficulty experienced heretofore in assembling the members of the fan wheels or impellers, and that by the use of this apparatus such assembling can be effected more rapidly, easily, thoroughly and economically and materially reduce the cost of manufacture.

I claim as my invention:

1. An apparatus of the character described comprising a lower support upon which one side member of a fan impeller is adapted to be mounted, spring pressed pins adapted to engage with the lower ends of the tenons on the blades which interlock with said side member, and a pressure plate adapted to engage with the other side member of the fan impeller and press the same into interlocking engagement with the tenons on the other ends of said blades.

2. An apparatus of the character described comprising a lower support upon which one side member of a fan impeller is adapted to be mounted, spring pressed pins adapted to engage with the lower ends of the tenons on the blades which interlock with said side member, and a pressure plate adapted to engage with the other side member of the fan impeller and press the same into interlocking engagement with the tenons on the other ends of said blades, and a clamping device adapted to engage the outer sides of said side members and hold the same in engagement with said blades independently of said supporting and pressure plates.

3. An apparatus for assembling a fan having annular side members and an annular row of blades which engage their opposite ends with said side members, said apparatus comprising a support having an annular seat adapted to receive one of said annular side members in position to be engaged by one of the ends of said blades, and means for engaging the other annular side member and pressing the same against the other ends of said blades.

4. An apparatus for assembling the annular side members and transverse blades of a fan impeller comprising means for receiving said parts and holding them loosely while being assembled and means for gripping said parts and holding the same rigidly while completing the connection between said parts.

5. An apparatus for assembing the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, and gage means arranged on said support and adapted to interlock with the other side member and hold the same in position for engaging its openings with the tenons on the other ends of said blades.

6. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, gage means arranged on said support and adapted to interlock with the other side member and hold the same in position for engaging its openings with the tenons on the other ends of said blades, and means for interlocking said first mentioned side member with said support.

7. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged

by the tenons on one end of said blades, and means for interlocking said first mentioned side members with said support.

8. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades and a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate.

9. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate and spring pressed pins mounted on said support and adapted to be engaged by the tongues at the lower ends of said blades.

10. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate, spring pressed pins mounted on said support and adapted to be engaged by the tongues at the lower ends of said blades, a base upon which said support is mounted, a tension rod connected with said base, and a wedge engaging said rod and bearing against the pressure plate.

11. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, and a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate, and a clamping device adapted to hold said side members in engagement with said blade while said side members and blades are removed from said supporting and pressure plates.

12. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongue, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, and a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate and a clamping device adapted to hold said side members in engagement with said blade while said side members and blades are removed from said supporting and pressure plates, and comprising two clamping rings adapted to engage the outer sides of said side members, and tie rods each permanently connected at one end with one of said clamping rings and detachably connected at its opposite end with the other clamping ring.

13. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades, and a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate, a clamping device adapted to hold said side members in engagement with said blade while said side members and blades are removed from said supporting and pressure plates, and means mounted on said clamping device and adapted to move between said blades for righting them.

14. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues, comprising a lower supporting plate adapted to support one of said side members in a position in which the openings therein may be engaged by the tenons on one end of said blades and a pressure plate adapted to engage the other side member and hold its openings in interlocking engagement with the tongues at the opposite ends of said plate, a clamping device adapted to hold said side members in engagement with said blade while said side members and blades are removed from said supporting and pressure plates, and means mounted on said clamping device and adapted to move between said blade for righting

them comprising a plurality of brackets arranged on one of said clamping rings, and an alining plate guided on each of said brackets and movable into and out of the space between the opposing sides of two adjacent blades.

15. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues and also with annular flanges, comprising a lower supporting plate having a marginal rim adapted to support one of said side members with its flanges engaging opposite sides of said rim, yielding tension means mounted on said lower supporting plate and adapted to engage the lower ends of the tenons on said blades which interlock with the openings in said lower side member, and a pressure plate adapted to engage the other side member and hold the same in a position in which its openings engage with the tongues at the upper ends of said blades.

16. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues and also with annular flanges, comprising a lower supporting plate having a marginal rim adapted to support one of said side members with its flanges engaging opposite sides of said rim, yielding tension means mounted on said lower supporting plate and adapted to engage the lower ends of the tenons on said blades which interlock with the openings in said lower side member and a pressure plate adapted to engage the other side member and hold the same in a position in which its openings engage with the tongues at the upper ends of said blades, the upper side of said rim being provided with an annular channel which receives the lower end of said blades.

17. An apparatus for assembling the parts of a fan impeller consisting of transverse blades having tongues at opposite ends and annular side members provided with openings to receive said tongues and also with annular flanges, comprising a lower supporting plate having a marginal rim adapted to support one of said side members with its flanges engaging opposite sides of said rim, yielding tension means mounted on said lower supporting plate and adapted to engage the lower ends of the tenons on said blades which interlock with the openings in said lower side member and a pressure plate adapted to engage the other side member and hold the same in a position in which its openings engage with the tongues at the upper ends of said blades, said lower supporting plate consisting of upper and lower sections, the upper section being provided with an annular row of enlarged pockets and a reduced guide opening at the upper end of each pocket and said lower plate being provided with a reduced guide opening below each of said pockets, and said yielding tension means comprising a plurality of upright pins each having reduced upper and lower ends guided in said upper and lower guide openings and an enlarged collar between its ends arranged in the respective pocket, and a spring arranged in each pocket and bearing at its upper end against the collar of the respective pin and at its lower end against the lower section of said supporting plate.

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