(No Model.) 3 Sheets—Sheet 1.

J. STEWART.

FAN FOR VENTILATING PURPOSES.

No. 382,119. Patented May 1, 1888.

Fig. 1.

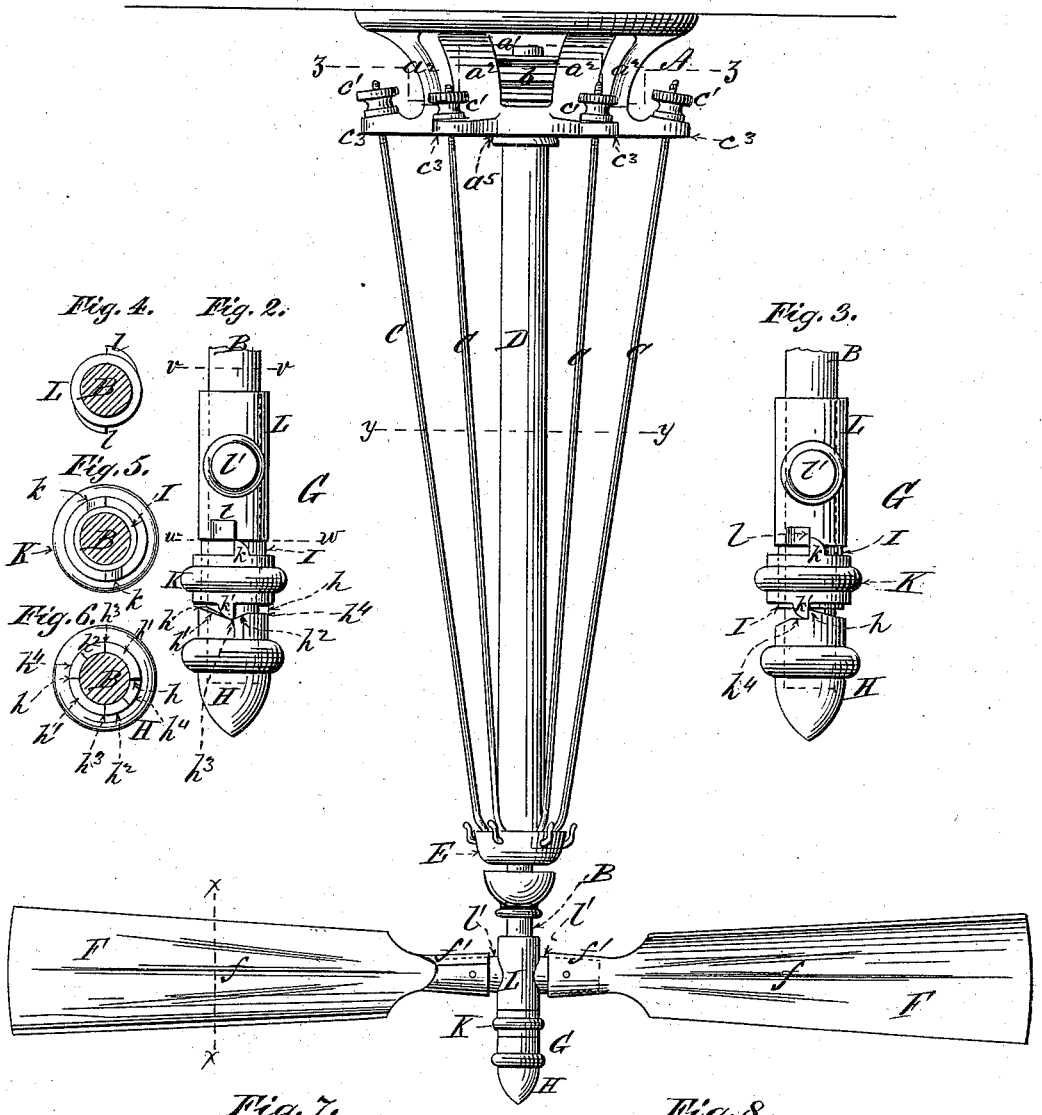

Fig. 4.

Fig. 2.

Fig. 3.

Fig. 5.

Fig. 6.

Fig. 7.

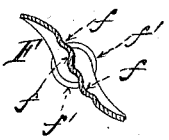

Fig. 8.

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Fig. 9.

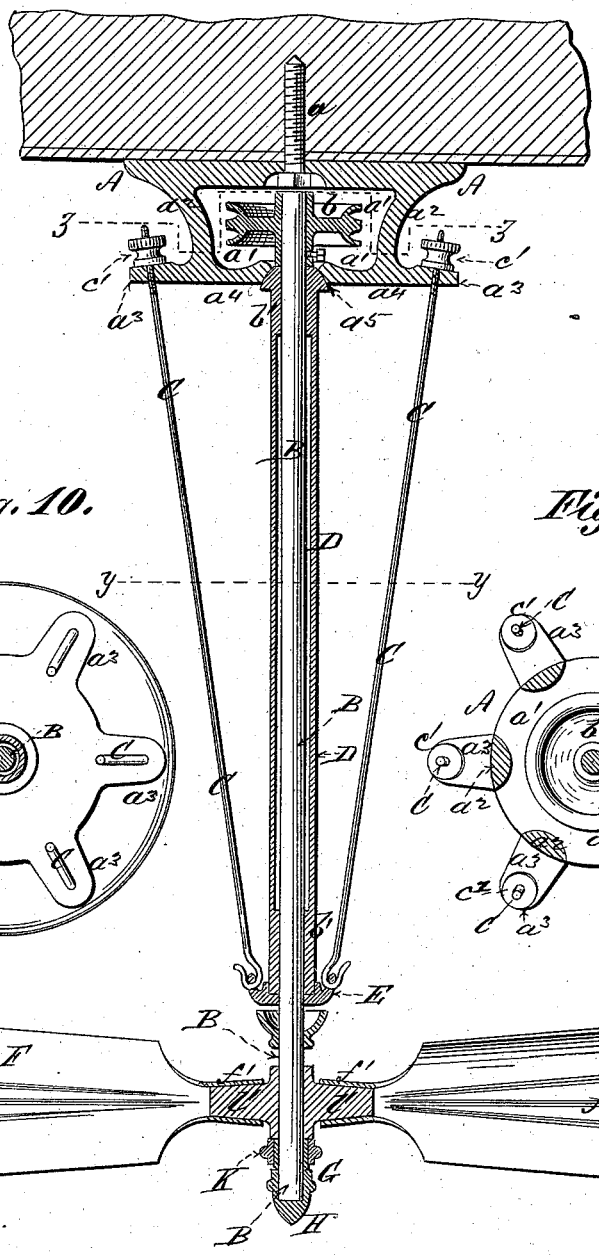

Fig. 10.

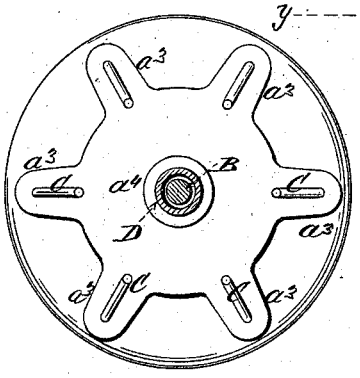

Fig. 11.

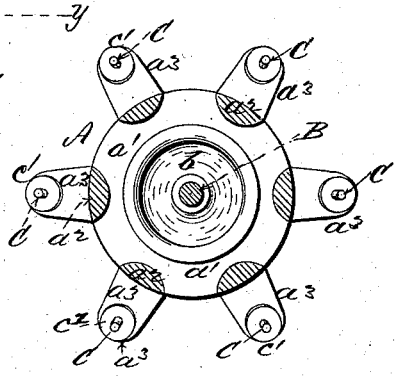

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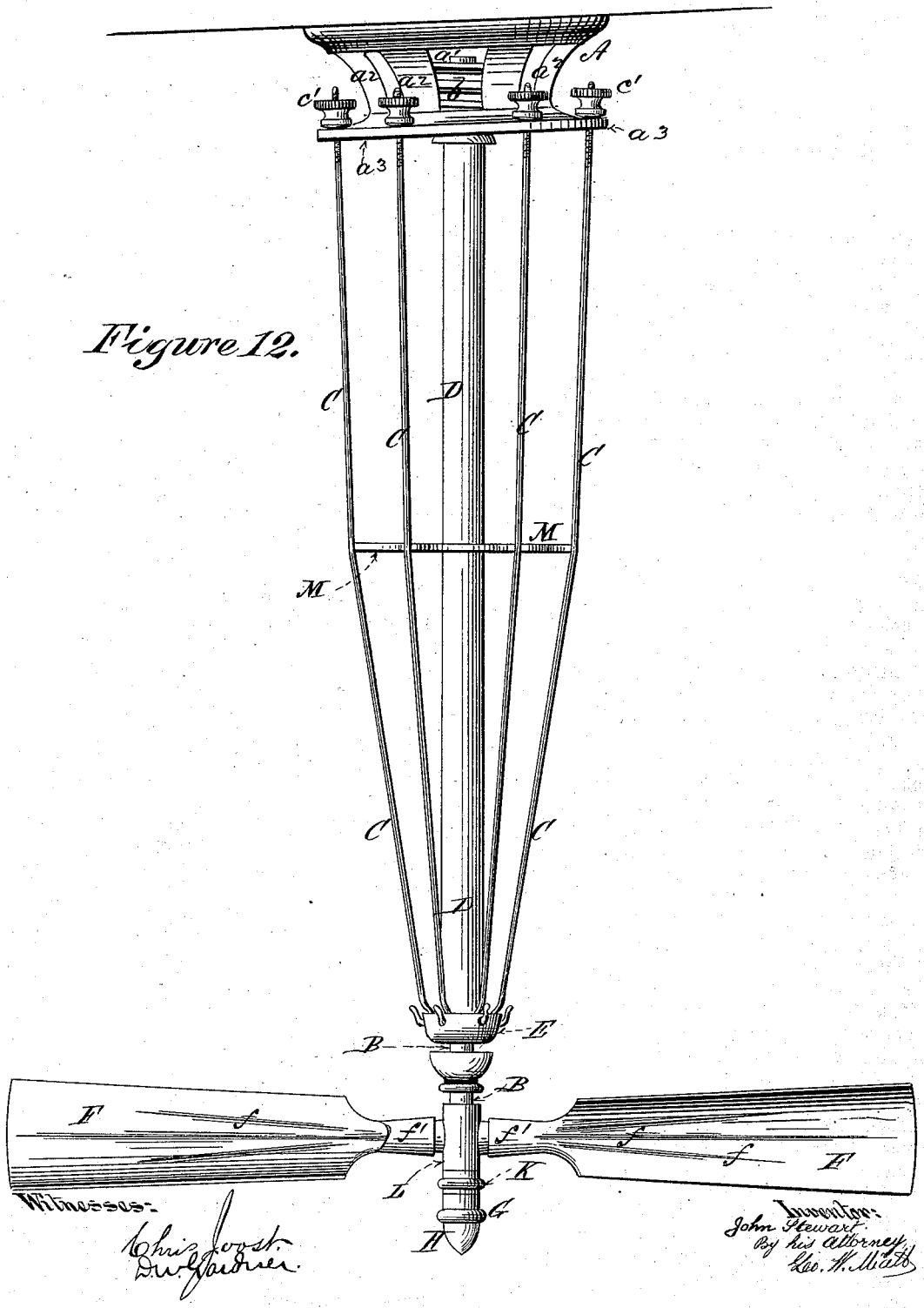
Figure 12.



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UNITED STATES PATENT OFFICE.

JOHN STEWART, OF NEWARK, NEW JERSEY.

FAN FOR VENTILATING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 382,119, dated May 1, 1888.

Application filed August 22, 1887. Serial No. 247,504. (No model.)

To all whom it may concern:

Be it known that I, JOHN STEWART, a citizen of the United States, residing in the city of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Fans for Ventilating Purposes, of which the following is a specification, sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My improvements relate to the class of rotatable fans ordinarily suspended from the ceiling of a compartment, which are employed largely for forcing a circulation or change of air in buildings.

Heretofore difficulty has been experienced in arranging and mounting the fans where any variation or inclination of the ceilings or supports existed in the apartment to be furnished with the fans, owing, primarily, to the absence of any feature of adjustment or adaptability in the brackets used for the suspension of the fans and their spindles.

In order that the apparatus shall operate satisfactorily and without undue strain, wear, and noise, it is essential not only that the fan-spindles occupy true vertical positions, but also that their driving-pulleys shall occupy the same horizontal plane, so that it is obvious that suspending brackets or frames permanent and unvariable in size and shape, and rigid throughout—such as have been and are now largely in use—are not adapted for use under all circumstances and conditions, necessitating frequently expensive alterations or additions to an apartment to be fitted or the designing and special construction of brackets suitable to the requirements of that particular case.

Another serious objection to the old form of suspending frame or bracket is that, being made almost entirely of cast-iron, it not only lacks strength, but is also heavy and clumsy and becomes a decided obstruction to light.

Owing to the distance between the lower end of the shaft and hanger and the actual point of suspension above, any unusual pressure exerted upon such lower portion of the device is liable to snap or break off the bracket or standard at its upper end by reason of the great leverage brought to bear at that point under such circumstances, and in practical use this defect has proved an actual source of danger, as well as an inconvenience and expense.

Another objection to the old form of comparatively heavy rigid cast-iron suspenders or brackets is the inconvenience involved in handling, packing, and transporting them, since it would not be practicable to take them apart, and they therefore occupy a maximum degree of room and require unusual care in packing, unpacking, and "setting up," owing to their inherent brittleness and liability to fracture. For these and various other reasons connected with their manufacture the cast-iron suspenders or brackets are both expensive and ineffective; and it is the main object of my invention to obviate the difficulties and dangers of construction designated, and at the same time produce a cheaper, lighter, and stronger means of suspension or support, which can be readily taken apart for packing or transportation and rapidly applied and accurately adjusted to conform to the varying conditions and requirements of actual use in different buidings or compartments.

In this connection my invention consists, essentially, in a hanger or bracket for the fan-shaft, &c., formed of a comparatively light rigid central bearing piece or extension, which is connected with a suitable standard or crown-piece attached to the ceiling or other support by a series of stay rods or wires; also, in means for tightening and adjusting the said stay rods or wires, and for adapting the central bearing or extension piece to the requisite vertical position irrespective of any inclination or irregularity in the ceiling or support.

My invention also includes a special form of stopping and starting clutch for the lower end of the fan-shaft, which is positive in its action and simple in its construction and operation.

The whole device, constructed according to my invention, is comparatively light in weight and graceful and airy in appearance, and while affording but little obstruction to light combines a high degree of strength with a certain degree of elasticity, which decreases the danger of fracture or derangement to the minimum. In fact, the stay rods or wires, by re-

ceiving and distributing any lateral strain to which the device may be subjected, while rendering the hanger sufficiently rigid and permanent in form for all purposes of legitimate use, practically relieve the vertical shaft and the central extension-piece from all pressure or strain, except in a longitudinal direction. This result is further contributed to by the form of joint between the upper end of the central extension-piece and the crown-piece or standard, since there is no positive connection between said parts and the extension-piece is free to adapt itself to lateral strain. As the corresponding point in the old form of rigid hanger has heretofore been the weakest and the most frequently fractured in all cases of accidental or undue lateral strain or vibration, the importance and superiority of my improved construction are unquestionable.

In the accompanying drawings I illustrate means for carrying out practically the essential features of my improvements, although I do not wish to confine myself strictly to the identical form and construction of parts shown, since it is obvious that various changes and modifications may be employed without deviating materially from the spirit and intent of my invention.

In the accompanying drawings, Figure 1 is an elevation of an apparatus embodying my improvements; Fig. 2, an elevation of the lower end of the rotary vertical shaft, showing the parts in the relative positions which they assume when the fan-blades are disconnected; Fig. 3, a similar view showing the parts in the positions which they are made to assume when the fan-blades are connected to rotate with the shaft. Fig. 4 is a transverse section of the rotary shaft upon plane of line *v v*, Fig. 2, showing a plan of the fan-sleeve. Fig. 5 is a transverse section of the rotary shaft upon plane of line *w w*, Fig. 2, showing a plan of the connecting and disconnecting sleeve and the rigid sleeve or enlargement of the shaft upon which it is movable vertically; Fig. 6, a transverse section of the rotary shaft, showing a plan of the rigid cam and shoulder flange or sleeve upon which the connecting and disconnecting sleeve rests. Fig. 7 is a transverse section of one of the fan-blades upon plane of line *x x*, Fig. 1. Fig. 8 is an end elevation of one of the fan-blades. Fig. 9 is a vertical longitudinal elevation of my improved fan and suspending bracket or frame; Fig. 10, a transverse section upon plane of line *y y*, Figs. 1 and 9, looking toward the standard or crown-piece; Fig. 11, a transverse section of the standard or crown-piece, taken zigzag, line *z z*, Figs. 1 and 9, looking in the direction of the fan blades. Fig. 12 is an elevation similar to Fig. 1, showing the apparatus applied to an inclined ceiling or other support, and illustrating the use of a lateral brace or expander for the stay-rods.

The standard or crown-piece A is made of any suitable material, preferably of annealed cast-iron, and is secured to the ceiling or other support by the lag-screw *a* or by other appropriate means. A central space or compartment, *a'*, is formed between the webs a^2 a^2 of the standard for the accommodation of the driving-pulley *b* and upper end of the vertical shaft B, and externally the crown-piece A is formed with a series of radial lugs a^3 a^3, corresponding in number to the stay-rods C to be used; or, instead of the radial lugs a^3 a^3, an annular flange, a^3, as an equivalent, as shown in Fig. 12, may be substituted, if preferred.

The lower face or flange, a^4, of the crown-piece or standard A is formed with a central seat or bearing, a^5, for the reception of the upper end of the central extension-piece, D. This joint between the parts is preferably, though not necessarily, in the form of a ball-and-socket joint, as shown in the drawings, to allow the extension-piece to adapt itself readily to any lateral or vibratory motion or strain, although any ordinary loose flange joint or other form of connection that is not rigid and positive will answer the purpose very well. Where, however, there is any considerable deviation or inclination in the ceiling or other support to which the device is to be applied, (as illustrated, for instance, in Fig. 12,) the ball-and-socket form of joint is effective in maintaining a firm even contact between the parts.

The central extension, D, may be of any desired form and construction, provided it is rigid, the essential feature being the provision of suitable bearings for the vertical rotary shaft B. It is, however, preferably made in a single piece and of a section of suitable tubing formed with interior bearings, *b' b'*, at or near each extremity, the intermediate or central portion being of greater diameter than the shaft B. Although it is obvious that various forms of central rods or extensions may be used, according to design or fancy, the tubular form shown has the advantage of strength and simplicity and of inclosing and protecting the main portion of the rotary shaft B.

The central extension-piece, D, is held against its seat a^5 in the crown-piece or standard by any suitable number of stay rods or wires C, connected to its other or lower extremity by any suitable means. A convenient means of effecting this connection consists in the use of a thimble-piece or cap, E, which fits over the end of the extension-piece D, and to which the stay rods or wires C are connected by hooking their ends in suitable holes, or by any other suitable or well-known means of flexible connection.

The upper ends of the stay rods or wires C C may also be secured to the crown-piece or standard A by various well-known means. I prefer, however, to use a form of connection which will permit of their being tightened or adjusted at any time. As a sample means of effecting this result, the set-nuts *c' c'* are shown in the drawings holding the stay-rods C taut; but I do not confine myself to this means of securing and tightening the rods C, as I believe myself to be the first to combine and ar-

range the central extension, D, stay-rods C, and standard A in the manner herein designated.

The pulley *b* is secured rigidly to the upper end of the shaft B, and its hub rests against the upper end of the central extension-piece, D, so that the shaft-fan, &c., are suspended upon the latter and are controlled in position by it.

When a ceiling or other support is inclined or irregular, such deviation from the right line may be readily compensated for by "taking up" the difference upon the stays C upon one side or the other, as circumstances may require. This is illustrated in Fig. 12, in which it will be seen that, while the crown-piece or standard A is inclined, the extension-piece D and shaft B are vertical, while the driving-pulley *b* and fans F are horizontal.

It will be seen that the nuts *c' c'*, or their equivalent means of tightening and adjusting the stay-rods C, are the only things that secure the several parts of the hanger together, so that, in order to unship the latter for packing and transportation, it is only necessary to remove the said nuts from the ends of the stays C and the pulley from the upper end of the vertical shaft B, when the said parts may be readily separated and packed away in a comparatively small space. It follows as of course that the parts may be conveniently and quickly handled in assembling them for use, and since the standard or crown-piece A may first be secured in position and the other portions added one by one until completed I avoid the difficulty, expense, and danger involved in bodily raising and securing the comparatively heavy hangers heretofore used.

The stopping and starting clutch G is constructed as follows: To the end of the vertical shaft B a flange or horizontal cam, H, is rigidly secured, and slightly above this a rigid sleeve or enlargement, I, of the shaft affords a cylindrical bearing upon which the clutch ring or slide K is movable vertically in either direction. Above this point is situated the hub or sleeve L, which carries the fans F.

The clutch-ring K is formed with two vertically-projecting shoulders, *k k*, upon its upper side and two corresponding shoulders, *k'*, upon its under side. The fan-hub L is formed with two radial projections or shoulders, *l l*, opposed to the shoulders *k k*, upon the upper side of the clutch-ring K. The upper surface of the flange H is formed with two vertical shoulders, *h*, from which extend backward-inclined cam-surfaces *h'*, forming, with the opposed inclined surfaces h^2, depressions h^3, in which the stops or shoulders *k'* upon the under side of the clutch-ring K rest when the fans are uncoupled, as shown in Fig. 2, in which position it will be seen that the stops or shoulders *k k* coincide with but do not engage the lugs *l l* upon the fan-hub. When the parts are in these relative positions, the clutch-ring revolves with the shaft, but does not affect the fan-hub, which rests loosely upon the top of the enlargement or rigid sleeve I.

When it is desired to start the fans, the clutch-ring K is raised slightly until the shoulders *k'* rest upon the level surface h^4 and against the shoulders *h* upon the lower flange, H. This movement brings the shoulders *k k* upon the upper side of the clutch-ring into engagement with the radial lugs *l l* upon the fan-hub L, and the parts having assumed the relative positions shown in Fig. 3, the fans will rotate with the shaft.

When it is desired to uncouple the fan, the clutch-ring is raised still farther until the shoulders *k k* upon the under side of the clutch-ring clear and pass over the shoulders *h* upon the lower flange H, when the parts will immediately reassume the relative positions shown in Fig. 2.

The fan-blades F are made of sheet metal bent or struck up into the requisite form. In order to use comparatively thin metal and still attain the requisite degree of strength and stiffness, I form the blades with a suitable number of corrugations, *f f*, arranged lengthwise, as may be required. The blades are also made spiral or propeller shaped in general cross-section, as indicated in Figs. 7 and 8.

Provision is made for their attachment to the projecting arms *l' l'* of the fan-hub L by bending their inner ends up into the form of sockets *f' f'*.

It is to be understood that the means for supporting the fans, shafts, &c., may be reversed in position and arranged in the form of a standard mounted upon a support below instead of being supported from above, as shown, it only being necessary in such case to provide the shaft with a collar or flange which will rest against the thimble-piece or cap E, or the end of the extension-piece D, and thereby sustain the shaft in the one direction.

Where the hanger is of unusual length, I employ one or more lateral braces, M, as shown in Fig. 12, for the purpose of strengthening the device and rendering it more rigid.

The thimble-piece E, to which the lower ends of the stays C are secured, may be in the form of a flange attached to or formed directly upon the end of the extension-piece D.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a hanger for suspending ventilating-fans from above, substantially as described, the combination, with the vertical fan-shaft B, provided with the power-pulley *b* at its upper end, of the crown-piece A, inclosing the said pulley, the rigid central extension-piece, D, the upper end of which is seated in the said crown-piece, and the series of stay-rods C C, attached to the lower end of the extension-piece D and binding the latter to the said crown-piece, substantially in the manner and for the purpose described.

2. In a hanger for suspending ventilating-fans from above, substantially as described, the

combination, with the vertical fan-shaft B, provided with the power-pulley *b* at its upper end, of the crown-piece A, inclosing the said pulley, the rigid central extension-piece, D, the upper end of which is connected with the said crown-piece by means of a ball-and-socket joint, and the series of adjustable stay-rods C C, attached to the lower end of the extension-piece D and adapted to compensate for any deviation or inclination of the crown-piece with relation to the vertical extension-piece D and shaft B, substantially in the manner and for the purpose described.

3. In combination with a fan for ventilating purposes, the stopping and starting clutch G, consisting of the vertically-movable ring K, formed with the upper shoulders, *k*, and lower shoulders, *k'*, the rigid horizontal cam H, formed with the shoulders *h*, cam-surfaces *h'* h^2, and depressions h^3, and the fan-hub L, formed with the shoulders *l*, the whole arranged and operating substantially in the manner and for the purpose described.

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