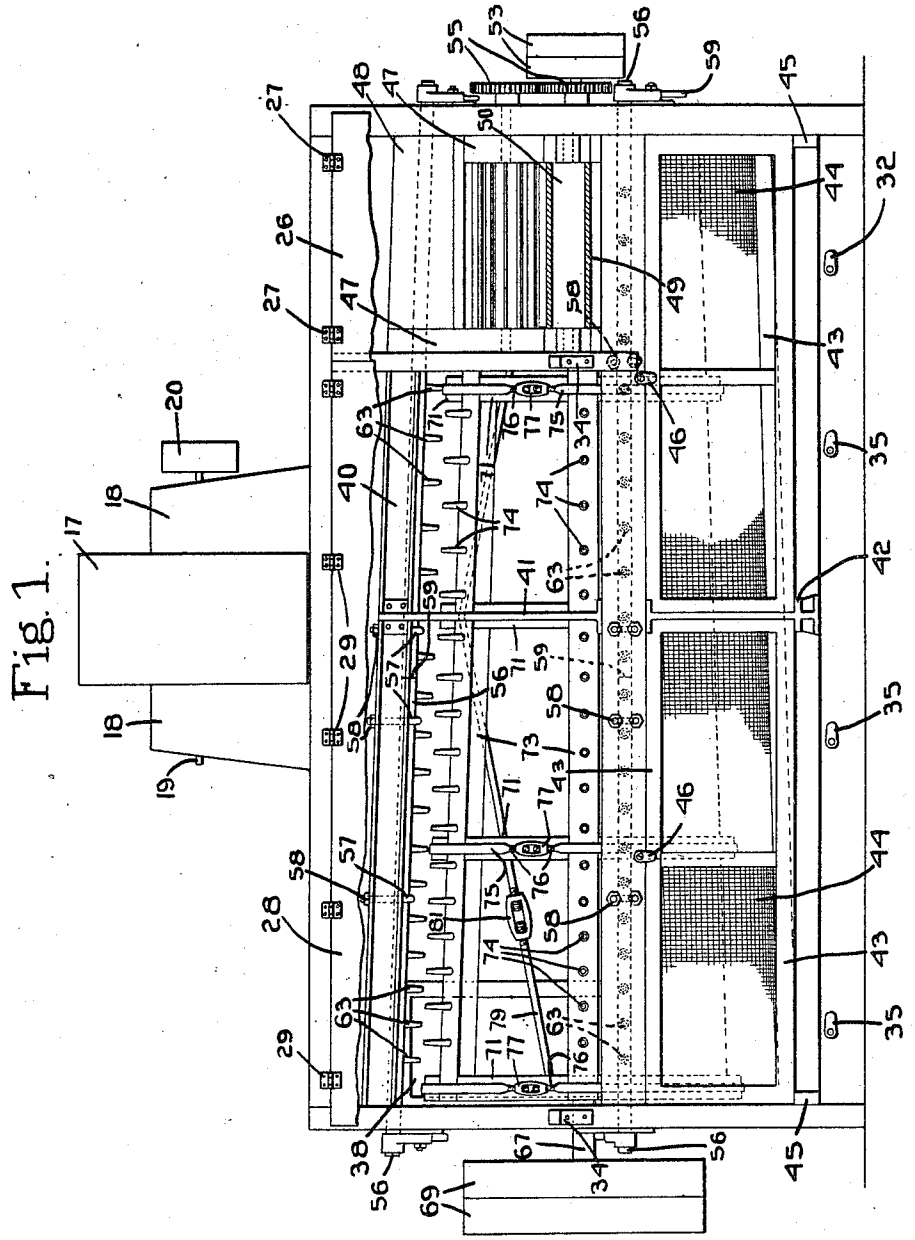
June 26, 1923. 1,459,938

C. P. R. THIEL

CONE DUSTER

Filed July 20, 1922 3 Sheets-Sheet 1

Fig. 1.



Inventor.
Charles P. R. Thiel
by Heard Smith & Tennant
Attys.

June 26, 1923. 1,459,938

C. P. R. THIEL

CONE DUSTER

Filed July 20, 1922 3 Sheets-Sheet 2

Fig.2

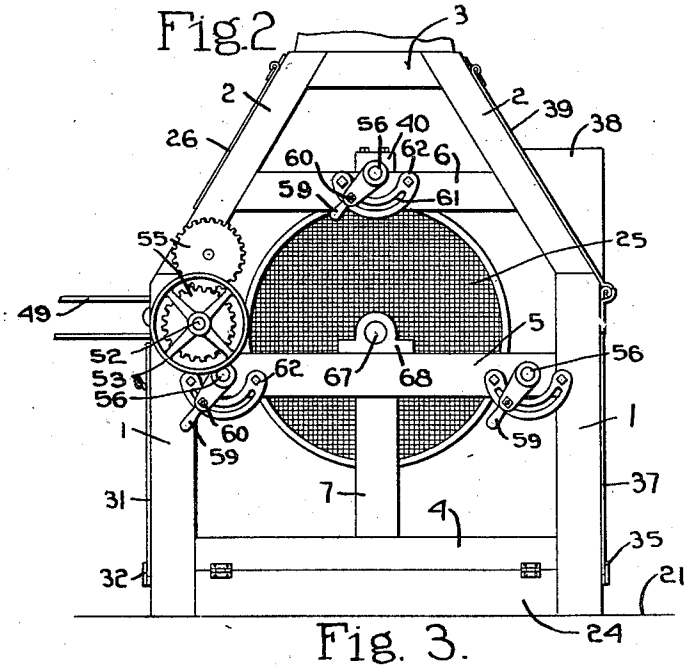
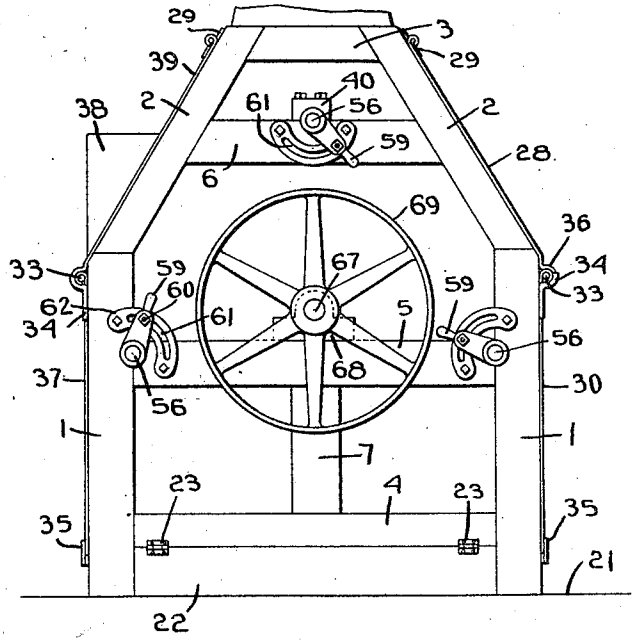



Fig. 3.




Inventor.
Charles P. R. Thiel
by Heard Smith & Fennant
Attys.

June 26, 1923. 1,459,938

C. P. R. THIEL

CONE DUSTER

Filed July 20, 1922 3 Sheets-Sheet 3

Fig. 4

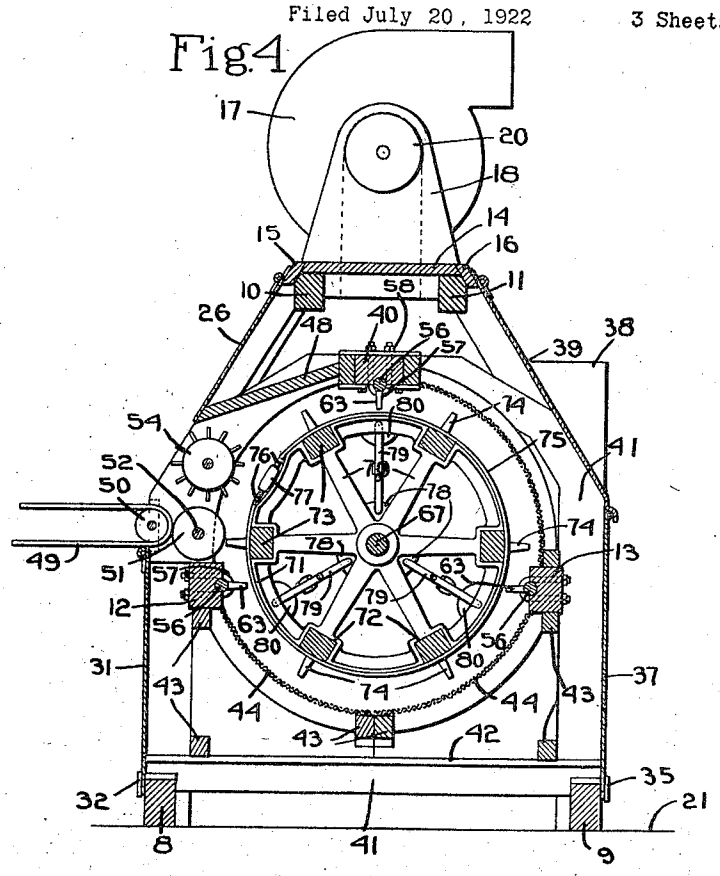



Fig. 5.

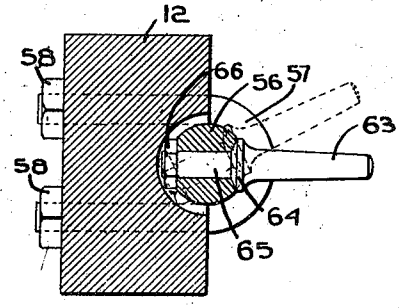
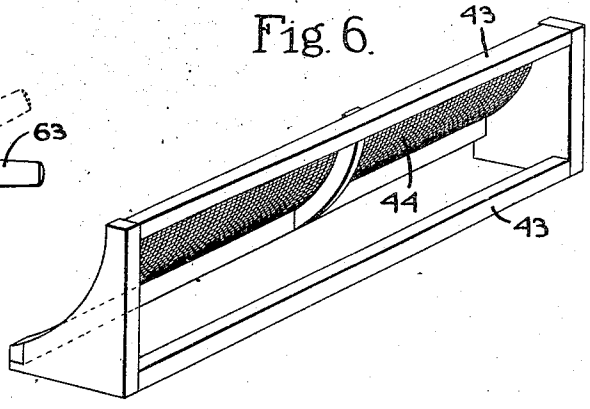



Fig. 6.




Inventor.
Charles P. R. Thiel
by Heard Smith & Fennant
Attys.

Patented June 26, 1923. 1,459,938

# UNITED STATES PATENT OFFICE.

CHARLES P. R. THIEL, OF NORTH ANDOVER, MASSACHUSETTS, ASSIGNOR TO DAVIS & FURBER MACHINE COMPANY, OF NORTH ANDOVER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

## CONE DUSTER.

Application filed July 20, 1922. Serial No. 576,323.

*To all whom it may concern:*

Be it known that I, CHARLES P. R. THIEL, a citizen of the United States, and a resident of North Andover, county of Essex, State of Massachusetts (whose post-office address is 55 Prescott Street, North Andover, Mass.), have invented an Improvement in Cone Dusters, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to a cone duster, a machine which in its general characteristics is familiar to those skilled in the textile art for cleaning or dusting all kinds of fibers, raw or treated. This type of machine usually comprises a cabinet within which is mounted a reticulated frusto conical cage through which the material being treated is fed. A revolving beater frame provided with projecting pins co-operating with fixed pins on the cabinet is mounted inside the cage and acts to loosen up the material and shake or beat out the dust and dirt. The heavier dirt falls to the bottom of the cabinet and is removed from time to time while the lighter dust rising to the upper part of the cabinet is sucked out by a suction fan.

One object of the present invention is to provide means for adjusting longitudinal sections of the fixed pins in their angular relation to the revolving pins so as to vary the action of the pins on the material as it passes through the machine. More particularly this novel means provides sectional bars carrying the fixed pins so that any section may be rotarily adjusted to vary the angular relation of the pins with respect to the opposed revolving pins. Thus, for example, the action of the co-operating pins on the material at the commencement of the operation may be made less severe than as the operation proceeds. This minimizes the injury to the fibres and maintains the maximum length of staple during the cleaning operation.

A further object of the invention resides in the decrease of the spaces between the co-operating teeth progressively toward the discharge end of the machine. This decrease may progress space by space or by successive units or groups of spaces. The result is also to produce a less severe action of the co-operating teeth on the material during the earlier than during the latter stages of the operation.

A further object of the invention resides in the provision of means for securing a successive co-operation of the rows of pins, so that no two rows on the beater frame shall simultaneously co-operate with the rows of fixed teeth, and thus easing the action on the material.

A further object of the invention resides in the improved construction of the beater frame particularly in the provision of metal straps surrounding and holding firmly in place the longitudinal bars containing the projecting teeth of the rotating beater and in the means for trussing or bracing the frame. This beater frame rotates at a high rate of speed—in the vicinity of 350 revolutions per minute—and this feature of the invention protects against the powerful centrifugal action resulting from this high speed of rotation.

A further object of the invention resides in the construction by means of which a continuous space is provided surrounding the cage between it and the cabinet so that the suction fan connected at a suitable point to this space may remove all the lighter dust beaten out from the material. Heretofore, the space beneath the cage in the cabinet has been a dead air space and the lighter dust entering this space has been drawn back by the fan into the material and carried out with the material through the discharge opening to the detriment of the cleaning operation. The present invention eliminates this serious objection.

These and other objects and features of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

In the drawings:

Fig. 1 is a front elevation with the front cover plates removed showing a cone duster embodying a preferred form of the invention;

Fig. 2 is a right hand end elevation of the construction shown in Fig. 1;

Fig. 3 is a left hand end elevation of the construction shown in Fig. 1;

Fig. 4 is a view in vertical cross section taken through the feed opening of the machine shown in Fig. 1;

Fig. 5 is an enlarged detail in vertical cross section showing the construction of the adjustable pin bars mounted on the cabinet;

Fig. 6 is a perspective view of one of the lower removable sections of the cage.

The cone duster, as already pointed out, is a machine for removing the dust and dirt from fibrous materials of various kinds by a beating and combing operation during which the mass of fibres is pulled apart and shaken up so that the dirt and dust are beaten out and the fibres more or less straightened.

Such a machine in the construction illustrated comprises a large cabinet adapted to stand upon the floor and made up of a heavy wooden frame work and provided with enclosing walls. As illustrated, the end frames of the cabinet are similar. Each end frame comprises the vertical beams 1, terminating at their upper ends in inclined beams 2, and connected at the top by the cross beam 3. Transverse girders 4, 5 and 6 extend at suitable points horizontally between the vertical and inclined beams and a vertical strut 7 serves to brace and support the center of the girder 5 beneath the main shaft of the machine.

The end frames are connected by suitable girders extending longitudinally therebetween. As illustrated, there are two of these girders 8 and 9 at the bottom of the machine connecting the vertical beams 1, and two at the top 10 and 11, connecting the upper corners of the end frames. There are also two longitudinal girders 12 and 13 secured to the inner edges of the vertical beams 1 at the front and rear respectively of the frame.

The entire cabinet is closed except for the openings necessary for the functioning of the machine. At the top the cabinet is provided with a permanent cover 14 which may be secured to the girders 10 and 11 and extend down the front and rear a short distance at 15 and 16. The suction fan preferably is mounted on this cover and connects therethrough by suitable openings with the interior of the cabinet. The fan casing 17 is shown connected to side boxes 18 mounted on the cover 14 opening at the bottom into the cabinet and at the top into the fan casing. While the fan as shown is mounted on the top of the cabinet and connecting with the upper portion of the space surrounding the cage it is obvious that it may be located at any suitable position, as for example upon the floor and connect with the lower portion of the space. The fan which may be of any suitable type is driven by a shaft 19 from a pulley 20 connected to a suitable source of power.

At the bottom the cabinet is closed in any suitable manner and as shown by the flooring 21 of the room in which it is located. The left hand or discharge end of the cabinet, as shown in Fig. 3, is boarded up or otherwise closed between the cross beam 3 and girders 4, 5 and 6. Beneath the girder 4 a door 22 is mounted and hinged to the girder at 23 so as to allow access to the very bottom of the cabinet for cleaning out dirt. The right hand or admission end of the cabinet, as shown in Fig. 2, is closed in a similar manner and provided with a similar door 24 except that a circular opening covered by screening or reticulated metal 25 and corresponding to the end of the cage is provided. This also serves to admit air to the cabinet under the action of the suction fan.

The front and rear side walls are preferably closed by hinged or removable metal plates except at the openings provided for the admission and discharge of the material. As illustrated, a plate 26 hinged at 27 to the portion 15 of the cover is provided to cover the wall of the cabinet immediately above the admission opening for the material. Another plate 28 hinged at 29 to the cover 15 serves to cover the remainder of the front inclined wall of the cabinet. The straight front wall of the cabinet is covered by a large plate 30 and a small plate 31. The latter covers the section of the front wall beneath the admission opening and is removably held in place by turn buttons 32. The former or larger plate 30 is hinged at 33 in open bearing brackets 34 and held in place at the bottom edge by turn buttons 35. Thus the plate 30 may be swung up and, when desired, removed by lifting its hinged ends out of the bearing brackets 34. The plate 28 is flanged and curved at its lower edge 36 so as to fit snugly over the upper edge of the plate 30.

The rear wall of the cabinet is provided with removable hinged plates 37 on its vertical surface similar to the plate 30. The inclined surface of the rear wall is provided at the discharge or left hand end with a hood 38 forming the discharge opening for the material while the remainder of the inclined surface is covered by a hinged plate 39 similar to that on the front surface.

The cage through which the material passes while being treated is of frusto-conical shape with its smaller end terminating opposite the screening 25, already described, and with its larger end against the closed left hand end wall of the cabinet. This cage is formed of suitable reticulated material such as coarse wire screening supported in a suitable manner within the cabinet. The upper half of the cage is mounted on a frame work resting at the bottom on the girders 12 and 13 and at the top against a girder 40 supported on the cross girders 6 at the ends of the cabinet and consequently inclining downwardly toward the admission end.

An intermediate supporting structure is provided where necessary according to the

length of the cabinet and is herein shown as a cast metal frame 41 located centrally the length of the cabinet resting upon the girders 8 and 9 and secured to the girders 12, 13 and 40 in any suitable manner. The lower member of this cast structure or metal frame 41 is arranged horizontally with an upper flat flange 42.

The upper and lower halves of the cage are each preferably divided into removable quarter sections. One of the sections of the lower half is shown in perspective in Fig. 6. Each such section comprises a skeleton frame 43 supporting a section 44 of wire screening. Each section of the cage rests upon one of the cross bars 45 at one end and upon the flange 42 of the central structure at the other end and thus can readily be removed by lifting or removing the proper cover plate of the cabinet. These removable sections of the cage are held in place by the turn buttons 46 carried by the girders 12 and 13.

The lower quarter sections of the cage can, therefore, be slid out at the front or rear of the cabinet to enable the heavy dirt deposited in the bottom of the cabinet to be removed and the upper quarter sections can be lifted out when desired for the cleaning or repairing of the device. The front upper quarter section is constructed so as to provide a suitable admission opening. As illustrated, this section abuts against one of the side frames 47 of the admission opening into the cabinet which at the upper portion is covered by the plate 48.

The material to be treated is fed into the cage through the admission openings of the cabinet and cage by a suitable feeding mechanism. For this purpose an endless conveyor 49 is shown running over a roll 50. From this conveyor the material is delivered to a feed roll 51 carried by the shaft 52 controlled by fast and loose pulleys 53. A licker-in roll 54 is mounted above the said roll 51 and driven from the shaft 52 by means of interposed gearing 55.

The material is treated in its passage through the frusto-conical cage by being combed, torn apart and shaken up by a plurality of co-operating pins. Some of these pins are mounted in fixed position, projecting inwardly at the periphery of the cage and some are carried upon the exterior periphery of a rotating beater frame extending longitudinally through the center of the cage.

In the preferred form of construction illustrated the fixed pins are carried by a plurality of sectional bars mounted and independently adjustable rotarily in the cabinet and extending longitudinally thereof and parallel with the beater frame periphery and projecting into the cage. These sectional bars are conveniently mounted on the girders 12, 13 and 40 which, it will be seen, are arranged in a general way 120 degrees apart but with the space at the bottom between the girders 12 and 13 substantially greater for a reason hereinafter set forth. Each sectional bar 56 is mounted and made rotarily adjustable in the same manner and by similar means and hence it will be necessary to describe but one in detail. For that purpose the one mounted on the girder 12 is selected and is shown in detail in Fig. 5.

The bar 56 is of cylindrical shape and is seated in a semi-cylindrical recess formed on the inner face of the girder 12 and is held in place at intervals by U-bolts 57 surrounding the bar and passing through the girder 12 and secured by the nuts 58. The bar 56 is made in a plurality of sections, shown herein as two in number separated at the point 59. The sections of the bar 56 project through the end frames of the cabinet and each section is provided with a radially projecting handle 59. Each handle is provided with a clamping bolt 60 projecting through a segmental slot 61 in a fitting 62 secured to the end frame. Hence, by swinging the proper handle 59 and locking it by the bolt 60 each bar section 56 is rotarily adjusted into any desired position. The bars 56 are provided with the radially projecting pins 63, preferably constructed as shown in Fig. 5. Each pin 63 has a frusto-conical base 64 seated in a countersink in the face of the bar 56 and with a shank 65 passing through the bar 56 and secured by a nut 66 at the opposite face of the bar.

The beater frame is mounted on the main shaft 67 of the machine which is journalled in bearing blocks 68 mounted on the cross bars 5 of the end frames over the vertical struts 7. This shaft is controlled in its rotation by fast and loose pulleys 69 from a suitable source of power. Secured to the shaft 67 at suitable intervals are a plurality of cast metal spiders having the radial arms or spokes 70 and the peripheral flanges 71. These spiders are provided with longitudinally aligned peripheral seats 72, preferably at the end of each spoke 70, and in these seats are mounted bars 73 extending longitudinally of the beater frame from end to end. Each bar 73 carries a row of pins 74 rigidly secured to the bar, preferably in a similar manner to that by which the pins 63 are secured to the bar 56. These pins 74 project radially outward from periphery of the beater frame.

The beater frame has a very considerable speed of rotation, in present practice about 350 revolutions per minute. As it is a heavy structure, there is great danger from injury to the machine if the parts of the beater frame are not securely held against the centrifugal force resulting from the high speed of rotation. Such danger is eliminated by

the means provided in this invention for securing the parts of the beater frame in position. For this purpose a metal strap is provided surrounding each spider and the bars seated therein and this strap is made circumferentially adjustable. The details of a preferred form of metal strap are illustrated in Figs. 1 and 4 wherein it will be seen that the metal strap 75 completely surrounds the spider resting against its periphery and the outer surfaces of the bars 73 seated therein. The ends of the strap 75 are preferably threaded at 76 and united by a turn buckle 77 so that the strap may be circumferentially adjusted to fit snugly against the periphery of the spider and the bars 73 seated therein. This method of securing the bars 73 in the spider also provides a ready means for removal and replacement of the bars and pins whenever necessary.

The bars 73 are conveniently and preferably made of wood and may warp or loosen and disturb the shape and balance of the beater frame slightly. In order, therefore, to maintain the desired rigidity of the revolving beater frame means are provided for trussing or bracing the frame. For this purpose the hubs of the endmost spiders are shown as provided with enlarged sections 78, see Fig. 4, in which are mounted the ends of a plurality, herein shown as 3, of rods 79. These rods at their middle portion pass through lugs or enlargements 80 near the periphery of the central spider of the beater frame. Turn buckles 81 are interposed in each rod 80 so as to enable each rod to be drawn up taut. Thus a very firm bracing or trussing of the beater frame is provided entirely independently of the bars 73.

Certain features with respect to the arrangement and operation of the co-operating fixed and rotating pins which are provided by this invention for the efficient action on the material being treated are especially to be noted.

In the first place the pins are preferably arranged as illustrated in longitudinal rows and the rows of fixed pins are so related to the rows of revolving pins that no two co-operating sets function at the same time. In other words, the engaging action of the rotating and fixed pins upon the material is progressive. This is secured by the proper relative spacing circumferentially of the cage and beater frame respectively of the rows of fixed pins and movable pins. The paths of rotation of the pins on the beater frame, or the moving pins, pass between the pins on the cabinet, or the fixed pins, so that the material is beaten and pulled apart by the co-operative engagement of the rows of pins in the usual manner. The particular feature of the invention referred to is secured, as illustrated, by making the spaces between the fixed rows of pins and the spaces between the movable rows of pins neither equal nor an even multiple the one of the other. Looking, for example, at the construction as illustrated in Fig. 4 and assuming that the beater frame is rotating clockwise, it will be seen that the pins 74 at the upper left of the spider will co-operate with the pins on the bar 56 in the girder 40, that next the pins 74 on the lower left of the spider will co-operate with the pins on the bar 56 in the girder 12 and so on successively in progression with no two sets co-operating at the same instant. This result is secured because, as already noted, the spaces between the girders 12, 13 and 40 are not exactly 120 degrees, the space between the girders 12 and 13 being greater and the spaces between the girders 12 and 40 and the girders 13 and 40 being less than 120 degrees whereas the spaces between the rows of teeth on the beater frame are all equal and as shown 60 degrees.

In the second place the pins both on the beater frame and on the fixed bars are separated longitudinally by spaces decreasing in length toward the discharge end of the machine, that is to say, the spaces between the pins are wider at the admission end than at the discharge end. This decrease in the spaces may progress gradually or by units. The material is thus acted on less harshly at the beginning than at the end of the operation. At the beginning of the operation the material is matted and full of dirt and this condition is gradually diminished as the material passes through the machine. This feature assists also to maintain the maximum length of staple of the fibre by controlling the action of the pins on the fibre.

In the third place means are provided for adjusting the angular relation of the co-operating pins on the beater frame and on the cabinet so as to vary their action on the material. This is preferably secured by the rotary adjustment of the bars 56 in sections as already described. Thus by adjusting the sections of the bars 56 at the admission end so as to change the angle of the fixed pins with respect to the revolving pins the action of the co-operating pins on the material at the beginning of the operation can be made much less severe than at the conclusion of the operation.

The operation of the machine will be apparent from the foregoing description. The material is fed in on the endless conveyer 49 through the admission openings of the cabinet and cage and is thoroughly beaten and cleansed by the co-operating pins of the beater frame and cabinet and finally emerges through the discharge opening 38. The action of the co-operating pins upon the material during its treatment is under perfect control by means of the three features

just described. The result in practice is thoroughly to cleanse the material of dust and dirt and maintain to a remarkable degree the staple of the fibre.

The heavier dirt falls through the reticulations of the cage to the bottom of the cabinet and is readily removed by removing the sections of the cage, shown in Fig. 6, and by cleaning out the space beneath the cabinet through the doors 24 and the openings provided by the hinged plates on the front and rear vertical walls of the cabinet.

The lighter dust is sucked out by the suction fan. By reason of the construction which provides a continuous space surrounding the cage between it and the cabinet the lighter dust is sucked out from all parts of the cabinet by the fan and is not drawn back into the material and discharged therewith through the discharge opening as heretofore. This is an important feature of the invention. There is no dead air space beneath the cage. The lighter dust, both above and below the cage, is at all times under the control of the suction fan because of the continuous space provided entirely around the cage between it and the cabinet.

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

1. A cone duster comprising a cabinet, a beater frame mounted for rotation on an axis extending longitudinally of the cabinet and provided on its periphery with longitudinal rows of radially projecting pins, a plurality of sectional bars mounted and rotarily adjustable in the cabinet and extending longitudinally thereof and parallel with the beater frame periphery and each provided with a row of projecting pins, the paths of rotation of the pins on the beater frame passing between the pins on the bars, and means for independently and rotarily adjusting one or more sections of each bar to vary the angle of the pins thereon and consequently the action of the co-operating pins on the material.

2. A cone duster comprising the construction defined in claim 1 in which the means for rotarily adjusting the adjustable sections of the bars are located exteriorly of the cabinet.

3. A cone duster comprising the construction defined in claim 1 in which the pins in each row on the bars and on the beater frame are separated longitudinally by spaces decreasing in length toward the discharge end of the duster.

4. A cone duster comprising a cabinet, a beater frame mounted for rotation on an axis extending longitudinally of the cabinet and provided on its periphery with longitudinal rows of radially projecting pins, a plurality of sectional bars and means for rotarily adjusting one or more sections of each bar to vary the angle of the pins on the said sections with respect to those on the beater frame, and consequently the action of the co-operating pins on the material, the pins in each row of the bars and on the beater frame being separated by spaces decreasing in length toward the discharge end of the duster.

5. A cone duster comprising a cabinet, a beater frame mounted for rotation on an axis extending longitudinally of the cabinet and provided on its periphery with radially projecting pins, a plurality of pins mounted on the cabinet and projecting inwardly toward the beater frame, the paths of rotation of the pins on the beater frame passing between the pins on the cabinet, and means for adjusting the angular relation of adjacent co-operating pins on the beater frame and cabinet to vary their action on the material.

6. A cone duster comprising a cabinet, a beater frame mounted for rotation on an axis extending longitudinally of the cabinet and provided on its periphery with radially projecting pins, a plurality of pins mounted on the cabinet and projecting inwardly toward the beater frame, the paths of rotation of the pins on the beater frame passing between the pins on the cabinet, and means for adjusting one set of pins to vary the angular relation thereof to the other set and thereby to vary the action of the co-operating pins on the material.

7. A cone duster comprising a cabinet, a beater frame mounted for rotation on an axis extending longitudinally of the cabinet and provided on its periphery with radially projecting pins, a plurality of pins mounted on the cabinet and projecting inwardly toward the beater frame, the paths of rotation of the pins on the beater frame passing between the pins on the cabinet, and means for adjusting the pins on the cabinet angularly in planes transverse to the axis of the beater frame and consequently the action of the cooperating pins on the material.

8. A rotatable beater frame for a cone duster comprising a shaft, a plurality of spiders mounted on the shaft, a plurality of bars located on the spider periphery and extending longitudinally of the frame and each provided with radially projecting pins, and a plurality of metal straps one surrounding each spider and the bars seated therein and acting to retain the bars firmly in place.

9. A rotatable beater frame having the construction defined in claim 8 together with means for circumferentially and independently adjusting each of the straps.

10. A rotatable beater frame for a cone duster comprising a shaft, a plurality of spiders mounted on the shaft and having longitudinally aligned peripheral seats, a

plurality of bars located in the spider seats, extending longitudinally of the frame and each provided with radially projecting pins, a plurality of metal straps one surrounding each spider and the bars seated therein and acting to retain the bars firmly in place and means for circumferentially and independently adjusting each of the straps.

11. A cone duster comprising a cabinet, a reticulated cage mounted in the cabinet, a feed opening through the cabinet wall and cage, a discharge opening through the cabinet wall and cage, a beater mechanism within the cage, a continuous space surrounding the cage between it and the cabinet, and a suction fan connected to the said space whereby, as the material is fed through the cage and beaten, the heavier dirt is discharged on the bottom of the cabinet and the lighter dust is sucked out from all parts of the cabinet by the fan.

12. A cone duster comprising a cabinet, a reticulated frusto-conical cage mounted longitudinally in the cabinet, a feed opening through the cabinet wall and cage at the smaller end, a discharge opening through the cabinet wall and cage at the larger end, a beater mechanism within the cage, a continuous space surrounding the cage between it and the cabinet, and a suction fan connected to the said space whereby, as the material is fed through the cage and beaten, the heavier dirt is discharged on the bottom of the cabinet and the lighter dust is sucked out from all parts of the cabinet by the fan.

13. A rotatable beater frame for a cone duster comprising a shaft, a plurality of spiders mounted on the shaft, a plurality of bars located on the periphery of the spiders, extending longitudinally of the frame and each provided with radially projecting pins, and a plurality of symmetrically disposed adjustable truss rods secured at their ends near the center of the endmost spiders and engaging the center spider near its periphery and acting to brace the beater frame.

In testimony whereof I have signed my name to this specification.

CHARLES P. R. THIEL.