

(No Model.)

2 Sheets—Sheet 1.

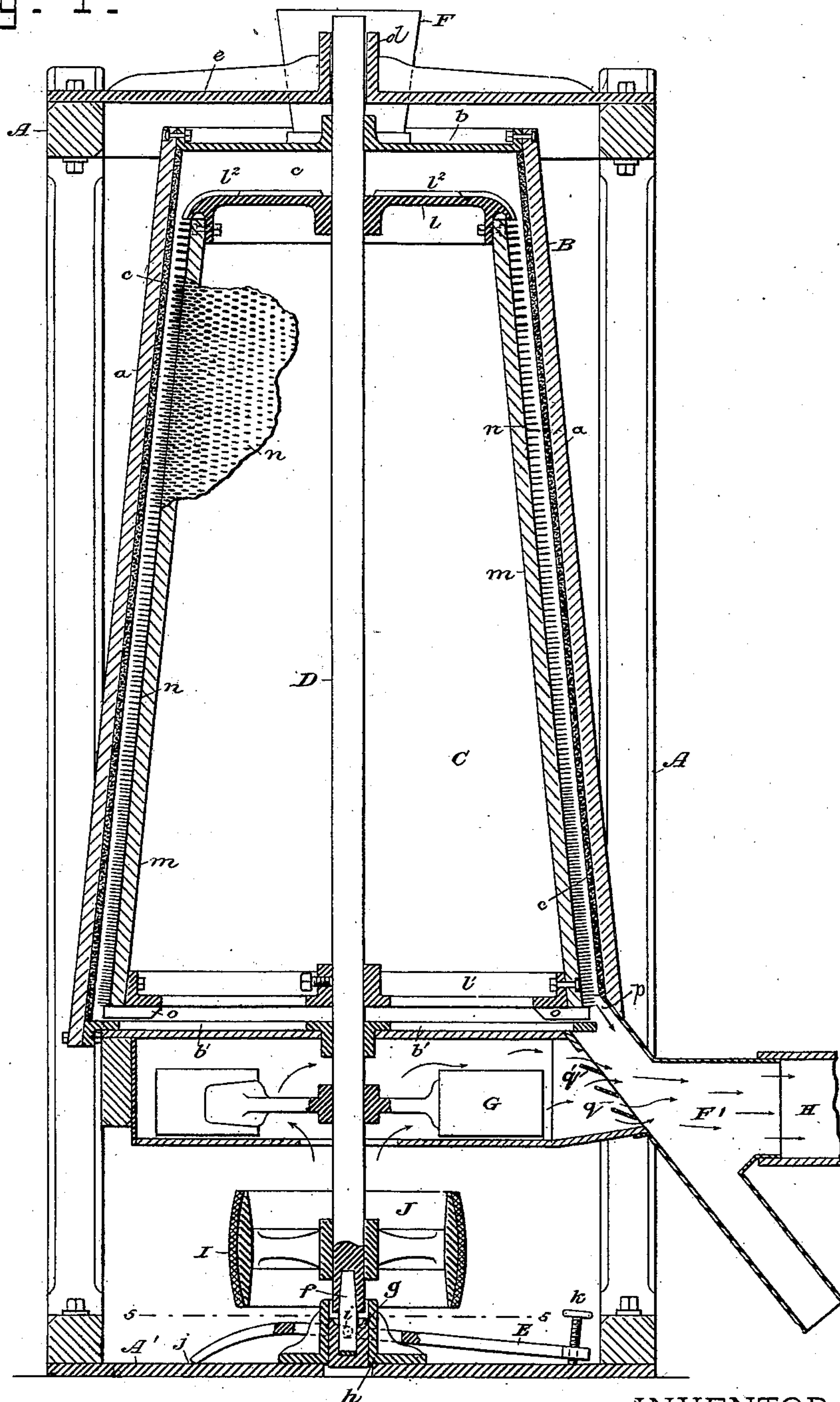
M. CRAWFORD.

MACHINE FOR REMOVING LINT OR FIBER FROM COTTON SEED.

No. 358,256.

Patented Feb. 22, 1887.

Fig. 1.



INVENTOR:

WITNESSES:

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

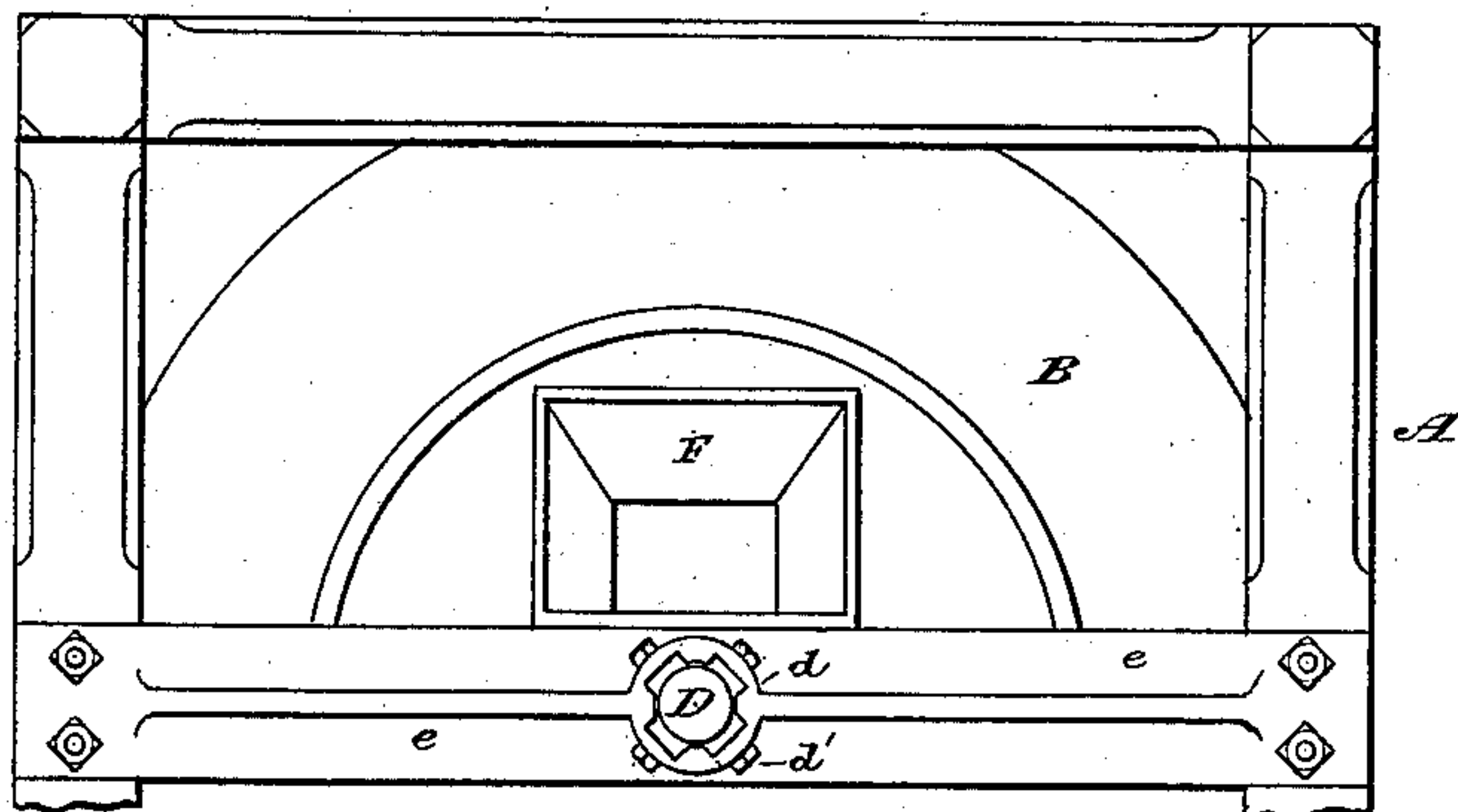


Fig. 3.

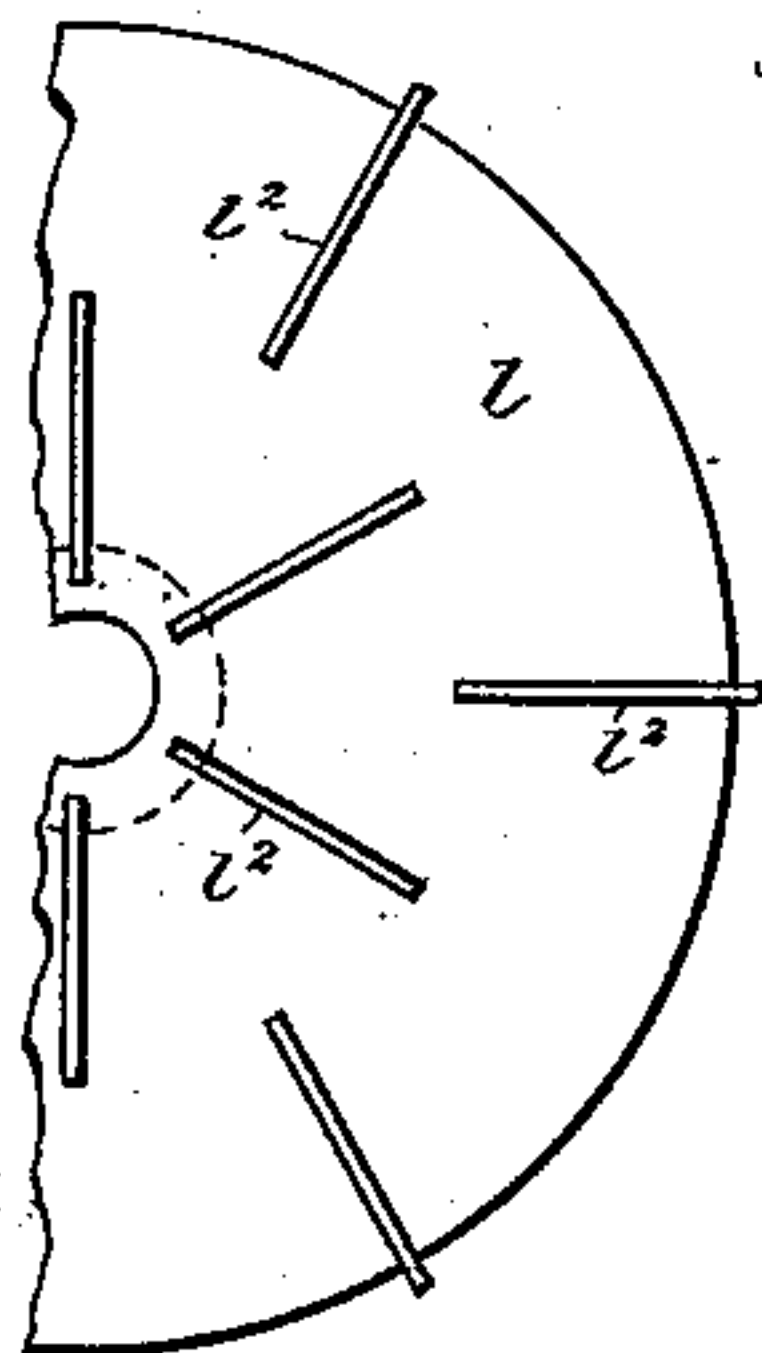


Fig. 5.

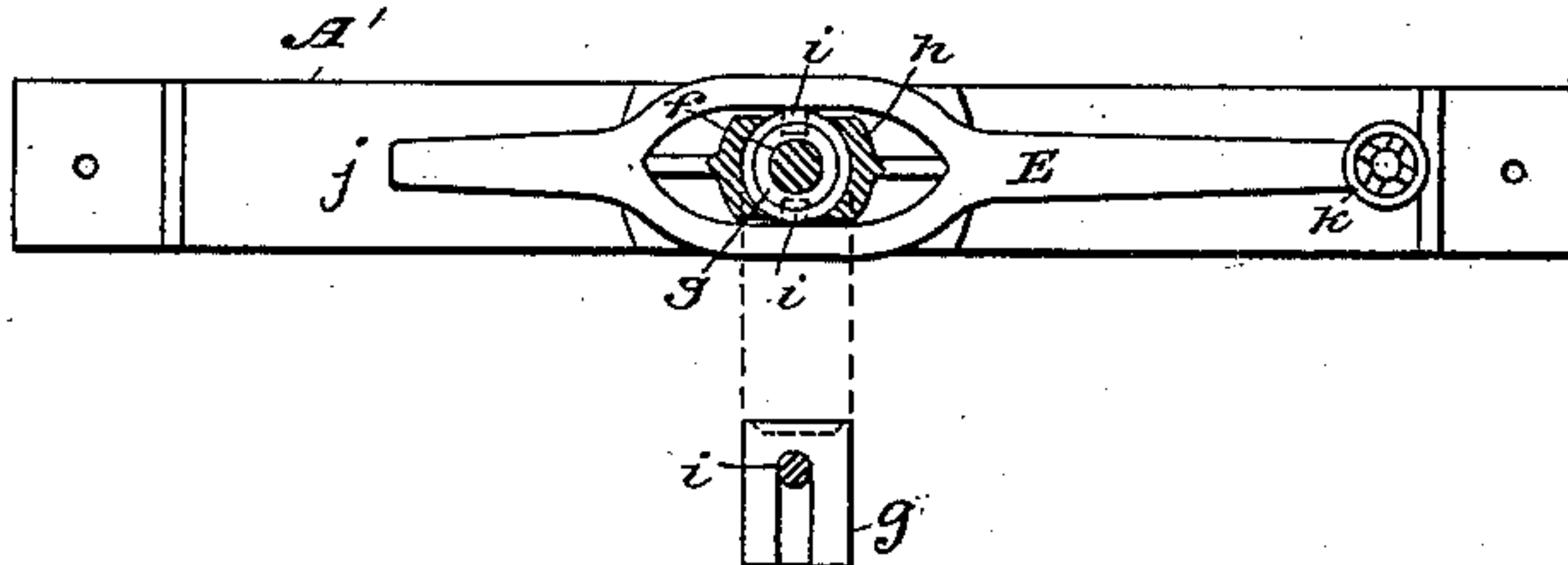


Fig. 6.

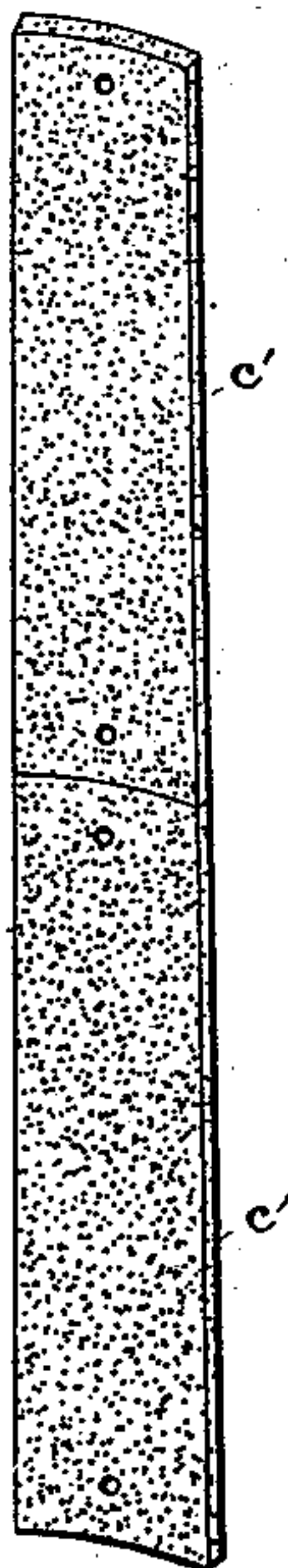
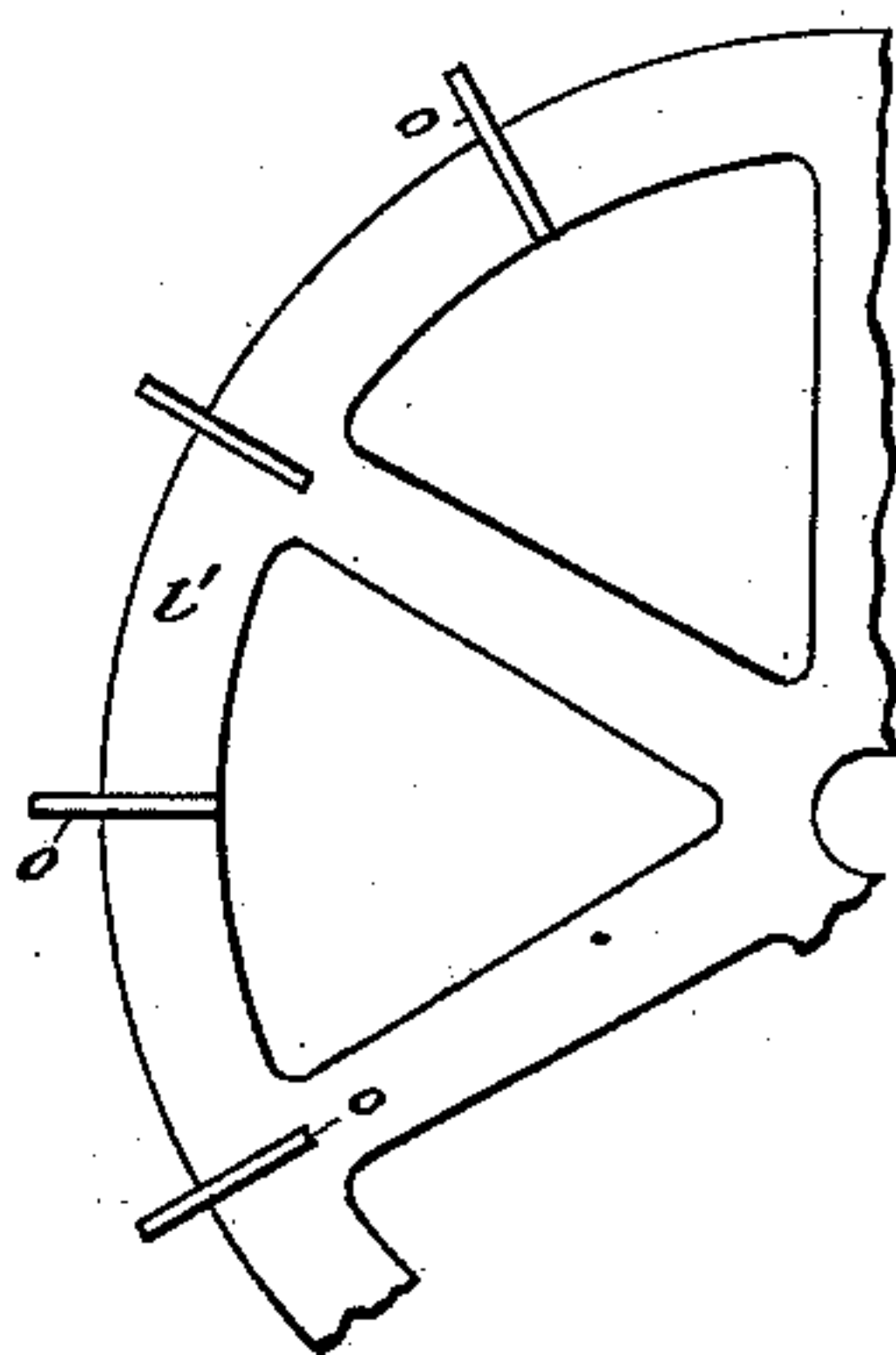


Fig. 4.



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UNITED STATES PATENT OFFICE.

MIDDLETON CRAWFORD, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE
AMERICAN COTTON SEED COMPANY, OF NEW JERSEY.

MACHINE FOR REMOVING LINT OR FIBER FROM COTTON-SEED.

SPECIFICATION forming part of Letters Patent No. 358,256, dated February 22, 1887.

Application filed October 20, 1886. Serial No. 216,718. (No model.)

To all whom it may concern:

Be it known that I, MIDDLETON CRAWFORD, a British subject, residing at Brooklyn, in the county of Kings and State of New York, have
5 invented certain new and useful Improvements in Machines for Removing Lint or Fiber from Cotton-Seed and for like Purposes, of which the following is a specification.

The object of my invention is the construction of a machine adapted to remove the lint or short fiber from cotton-seed after the ginning process, whereby the seed may be put in condition either for planting or for grinding and pressing in the manufacture of oil and oil-
15 cake.

Heretofore the ginned cotton-seed has been prepared for the manufacture of oil either by submitting it to an acid bath, which destroys the lint, or by cracking and removing the hard
20 shell that envelopes the kernel. The chemical process is objectionable, for the reason that a portion of the acid is retained by the seed, injuring the oil and rendering the oil-cake unfit for food, and for the further reason that the
25 destruction of the germ in a considerable percentage of the seed renders it unfit for planting; and the mechanical process is exceedingly wasteful, since it renders the shell and lint worthless, except for fuel.

The machine embodying my present invention removes and preserves every particle of the lint, which forms a valuable paper-stock, and at the same time delivers the seed thoroughly cleaned, wholly uninjured, and in perfect condition either for planting or for conversion into oil and oil-cake. The general form of this machine is similar to that of either of the grain-cleaning machines shown in my Letters Patent No. 348,826 and No. 348,890; but
40 the details of construction of the present machine necessarily differ from those of the prior machines in various ways, which will be apparent from the description herein, as well as from the accompanying drawings, in which—

Figure 1 is a vertical axial section of the machine, except as to a small portion of the exterior brush-surface of the cone, which is represented in elevation. Fig. 2 is a plan view of a little more than one-half of the top of the
50 machine. Fig. 3 is a plan view of one-half of

the top of the cone. Fig. 4 is an under side view of a part of the bottom of the cone. Fig. 5 is a plan view of the lever for effecting the vertical adjustment of the cone, the guide for the socket-piece in which the cone-shaft is stepped being in section. Fig. 6 is a view showing two of the sections forming the emery or abrasive surface or lining of the casing.

In the views, A represents an exterior frame of any kind, serving as a support for the operative parts. In this frame I mount a fixed
55 conical outer casing, B, usually constructed of a metal top plate, *b*, and bottom plate, *b'*, and wooden staves *a*, secured to said plates in any convenient manner, but preferably by means of bolts, permitting the independent removal of the staves. The top plate supports a suitable hopper, F, and is made with an opening forming the mouth of the hopper. The inner
60 concave face of this casing I cover with an abrasive material, preferably coarse emery; and in order to provide an abrading-surface, *c*, that will be durable and conveniently applied, I prefer to proceed as follows: I procure sections *c'* of the form seen in Fig. 6, made from
65 emery or corundum, mixed with other substances to form a body, and baked or burned somewhat in the manner of bricks. This compound is known as "Norton's emery," and may be purchased in open market, being well
70 known to the trade. These sections *c'* of the lining for the casing are given the proper width, length, and taper, so that when fitted together they will completely cover the inner face of the casing. I usually secure them to
75 the wooden shell of the casing by screws or bolts; small holes being formed in the sections in their manufacture to receive said screws or bolts, but other known fastening devices may be employed. I have found it desirable to
80 make these sections of such size and form with relation to the wooden staves of the casing that the inner surface of each stave shall be completely and exactly covered by a vertical band of the sections. The casing being, in fact,
85 made up of a series of independent staves, each lined with the emery sections or bricks, the staves being separately removable, and each of the emery sections being independently fastened to its stave, it is evident that the wear
90 100

of any part of the emery lining may be repaired at any time at slight expense and with but little trouble. The burned or baked emery bricks which I have found it best to use for this lining are, however, so hard and durable that they very seldom require renewal. They are much harder than any other grinding material with which I am familiar, and are therefore preferable to any other material for this purpose; but the intense heat to which they are subjected in their manufacture renders it impossible to make them in large plates, or to form them originally with a backing of wood or metal. It is therefore necessary to form them in comparatively small plates or bricks provided with means for attaching them to a shell in substantially the manner illustrated and described. While, therefore, I am aware that emery facings have heretofore been applied to the working parts of grain-cleaning machines, I believe that in every case it has been a different material from that applied in this instance, and has, in consequence, been applied in a widely different manner from that above described.

Within the casing and concentric with it is a cone, C, which is fixed on a shaft, D. This shaft has a bearing, *d*, laterally adjustable by means of set-screws *d'*, in a metal cross-bar, *e*, at the top of the frame, and another bearing in the bottom plate, *b'*, of the casing B. It may slide longitudinally in these bearings, and is stepped at its lower end. In the lower end of the shaft is a steel pin, *f*, which fits in a socket in a socket-piece, *g*, and this socket-piece rests in a socket-guide, *h*. In the opposite faces or sides of the piece *g* are formed recesses, which are engaged by studs *i i* on a lever, E, the end of which rests on the base-piece A' of the frame, at *j*, while a screw, *k*, through the other end of the lever, serves to raise or lower that end, and thus adjusts the cone and its shaft vertically. This construction is seen in plan in Fig. 5, the small figure below showing socket-piece *g* in elevation.

The body of the cone C consists of top and bottom plates, *l l'*, preferably of metal, and staves *m m*, preferably of wood, secured to the plates in any desired manner, but usually by means of bolts or screws, the top plate being provided with a series of rigid radial ribs or arms, *l'*, which serve to separate the cotton-seeds as they fall from the hopper F, and prevent them from passing to the cleaning-surfaces in wads or balls.

To the outer face of this cone-body is attached the card-clothing or other material, forming what I determinate the "brush surface" *n* of the cone. As the upper part of the cone will have to deal with the seed while it is still fully covered with the lint or fiber, just as the seed comes from the gin or "linter," I prefer to, and usually do, make this portion of the brush surface of stiffer or coarser wire than that on the lower part of the cone. This stiffer portion of the brush surface I prefer to extend down

about nine or ten inches on a full-size machine, where the cone is four feet in height, and the remaining space below this I prefer to divide into three equal parts and cover it with card-clothing varying in stiffness and fineness of the wire forming the teeth, the lower section being the finest and most supple, the next above a little coarser and stiffer, and the next above that a little coarser still. It would be possible to construct the brush surface of wire teeth which gradually decrease in stiffness from the top to the bottom of the cone. In Fig. 1 the wires or teeth of the brush surface are shown arranged farther apart than they should be in practice. This is in order to illustrate the surface and indicate its character more clearly.

I prefer to place the wires so close together as to prevent the admission of seed between them, though this is not absolutely essential; but it is important that their ends form a practically even surface, no part of which projects sufficiently to strike a seed a sudden blow. The space between the brush surface of the cone and the grinding-face *c* of the casing may of course be varied by the vertical adjustment of the shaft D and cone C; but it should never (at least in its upper portion) be less than the greatest length of the seed on which it is to operate. The ends of a seed can only be acted on by either the cone or casing when the axis of the seed is approximately radial, and sufficient space must therefore be allowed for an end-over-end rotation of the seed as it passes in a spiral path downward from the top of the machine. The seed and the detached lint, after issuing from the annular cleaning or seed space, fall onto the bottom plate of the casing and are swept around by radial blades *o o* on the bottom plate of the cone to the outlet *p*, where the seed falls into the inclined chute or spout F' and is led away. The lint or fiber, as it issues from the outlet *p*, is separated from the seed by a fan or blower, G, on shaft D, which sends a current of air through a louver-aperture, *q*, across the chute F', as indicated by the arrows in Fig. 1. This current or blast of air sends the lint into a chute, H; and it may pass thence into a room or lint-chamber of any suitable construction or form. The opening *q* is provided with inclined slats *q'*, designed to prevent the seed from falling into the fan-casing.

The operation of this machine is as follows: The hopper being filled with cotton-seed, the seed is fed gradually into the machine through the opening in the top plate of the casing and falls on the top plate of the revolving cone. The radial bars or arms *l'* of the top plate, which may properly be called "beaters," strike the mass of falling seed, break up the balls or wads, which are likely to be formed through the adhesive nature of the lint on the seeds, and throw the separated seeds evenly and regularly outward to the space between the cone and casing. As the seed drops downward

into this space it is subjected to the combined action of the rapidly-rotating brush surface of the cone and the stationary grinding-surface of the casing. The distance between the surfaces of the cone and casing being sufficient for the axis of each seed to assume a radial position with reference to the axis of the cone, the seed passes in a spiral path downward and around the cone, and in its course presents its entire surface to the action of one or the other of the abrading-surfaces between which it lies. The ends of the seed, while they are undoubtedly to some extent operated upon by the grinding-surface of the casing, are principally cleaned by the brush surface of the cone, and the sides of the seeds, on the other hand, are operated upon almost wholly by the grinding-surface of the casing.

In the course of the experiments leading to the construction of this machine I have tested various facings for both the cone and casing, and have found that the combination of a cone covered with an even brush surface and a casing lined with an even surface of emery or other grinding material gives the best possible results. On running the cotton-seed through a machine having an abrasive cone and a non-abrasive shell I found that the ends of the seed were free from lint, while the sides were practically unaffected by the action of the machine, and on testing various abrasive facings for the cone and casing, respectively, I found that, while an unyielding surface, such as emery, was best for the casing, a slightly yielding surface, such as that of a wire brush or card, was preferable for the cone.

I am aware that neither an emery surface nor a brush surface is a new element in a seed-cleaning machine; but I am satisfied that by the combination of these two surfaces I have produced the only machine yet devised capable of thoroughly freeing cotton-seed from lint.

Each of the operative surfaces should be practically even and uniform, since an uneven or broken surface, whether perfectly solid or somewhat yielding, operates unequally on the seed, and by striking its sudden blows tends to break it and mix more or less of the fragments with the lint, thereby lowering the grade of the lint and at the same time decreasing the quantity of oil-producing material.

The wire forming the brush may have any desired cross-section, and may be placed at any desired angle with reference to the surface of the cone. The form which I have thus far found most satisfactory is that of the ordinary card-clothing; but this is not essential. The grinding-surface of the casing may be formed of any compound of emery, corundum, sand, ground glass, or its equivalent; but the burned or baked bricks of Norton's emery form by far the most durable and satisfactory lining which I have thus far discovered.

I am aware that it has been proposed to combine in a rice-cleaning machine a cone and

shell both clothed with stiff wire and a second cone and shell both clothed with bristle brushes, the rice being passed first between the wire brushes, then winnowed, and then passed between the bristle brushes. The machine shown and described herein is, however, the first in which the cone has been covered with an approximately even wire brush stiffer at the top than at the bottom of the cone.

The form of cone and casing shown herein is one which I have found to give the most satisfactory results in the course of my experiments. The axis of the cone being vertical, and the cone having but slight taper, gravity alone tends to carry the seed downward at a speed nearly sufficient for the satisfactory operation of the machine. The slight increase in diameter of the cone from top to bottom causes the centrifugal force to aid the downward course of gravity and to increase the speed of motion of the seed from the top toward the bottom of the cleaning-space. While I do not desire or intend to limit the shape of the machine to the exact form of cone shown in the drawings, I consider it essential that the taper of the cone should be so slight that the wall of the casing will offer a considerable resistance to the centrifugal force with which the seed is thrown outward from the cone.

The cone and casing might be made so flat (that is, they might approximate so closely to the form of two coacting disks) that the centrifugal force would tend to throw the seed directly from the apex to the base of the cone, or, in other words, from the top to the bottom of the seed-cleaning space. The increase of diameter of the cone from top to bottom has the effect of producing a downward current of air between the cone and casing when the cone is rotated, and this current assists materially in carrying the lint through the machine. The specific gravity of the lint is so slight that this effect in a machine of this particular class is quite important.

It is of course important that the seed be not fed too fast or the machine will become choked; but the regulation of the feed depends so much on the size of the machine and the speed of rotation given to the cone that it is not practicable to give well-defined instructions. In practice I have found no difficulty in this respect, as it is only necessary to begin with a sparing feed and gradually increase it until the maximum for good work is reached.

The cone may be driven by means of a belt passing about a pulley rigidly fastened to the cone-shaft, or by any other ordinary means. As the machine is to be operated at a high speed, the belt and pulley forms the smoothest and most satisfactory means of rotating the cone; but any other mechanical equivalent of this means may of course be substituted.

Having now described my invention and explained its operation, what I claim as new, and desire to secure by Letters Patent, is--

1. In a machine of the class described, the

combination of a conical casing lined with an even surface of emery and a rotating cone concentric with the casing and covered with an approximately-even continuous brush surface
5 of wire, the emery surface of the casing and the brush surface of the cone being separated by a space for the passage of seed, substantially as and for the purpose set forth.

2. In a machine of the class described, the
10 combination of a conical casing lined with an even surface of emery and a rotating cone concentric with the casing, and provided with an approximately-even brush surface of wire

stiffer at the top than at the bottom of the cone, the emery surface of the casing and the brush 15 surface of the cone being separated by a space for the passage of seed, substantially as and for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing 20 witnesses.

MIDDLETON CRAWFORD.

Witnesses:

HENRY CONNETT,
FRANK MOULIN.