

(No Model.)

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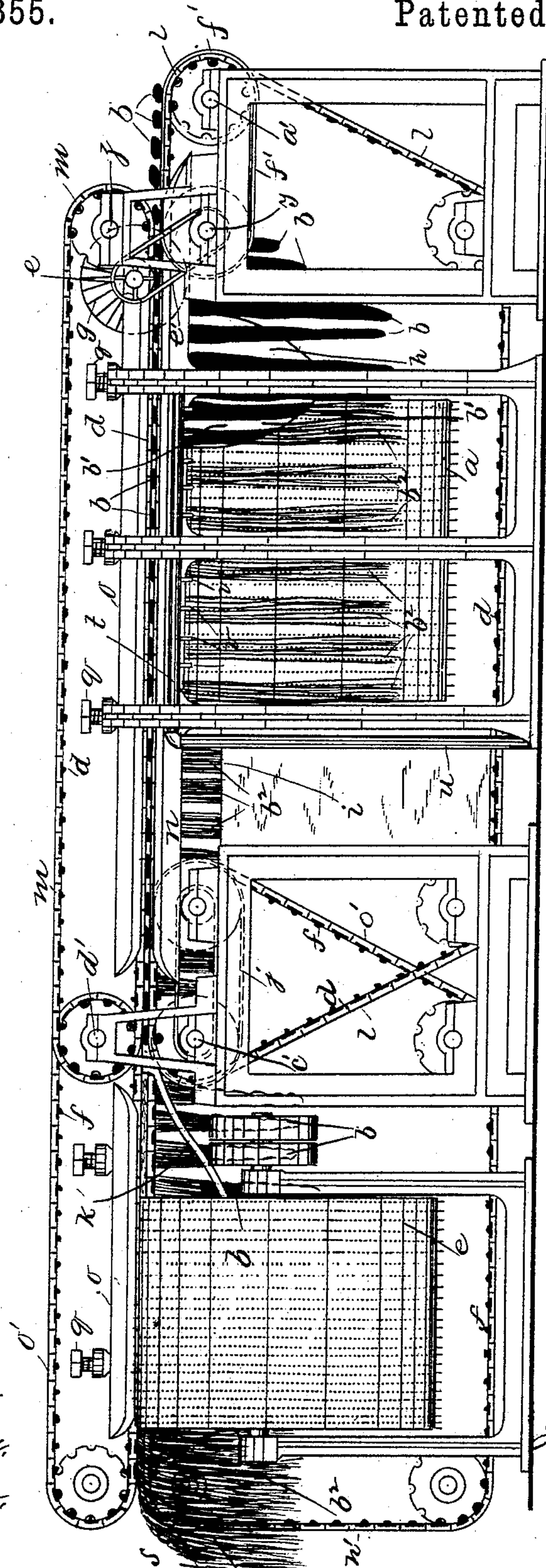
J. G. STEPHENS.

METHOD OF CLEANING AND SEPARATING THE PULPY MATTERS FROM
THE FIBERS AND LEAVES OF PLANTS.

No. 328,355.

Patented Oct. 13, 1885.

Fig. 1.



WITNESSES.

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INVENTOR.

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3 Sheets—Sheet 2.

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Fig. 2.

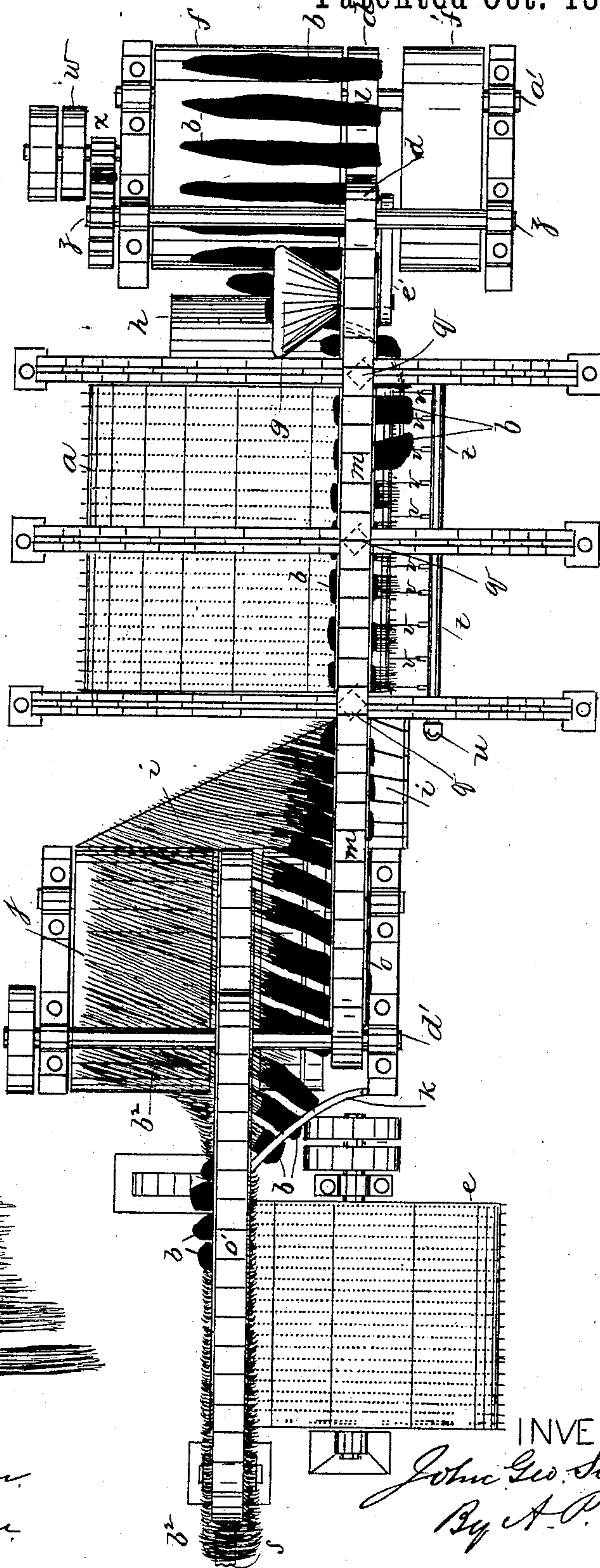
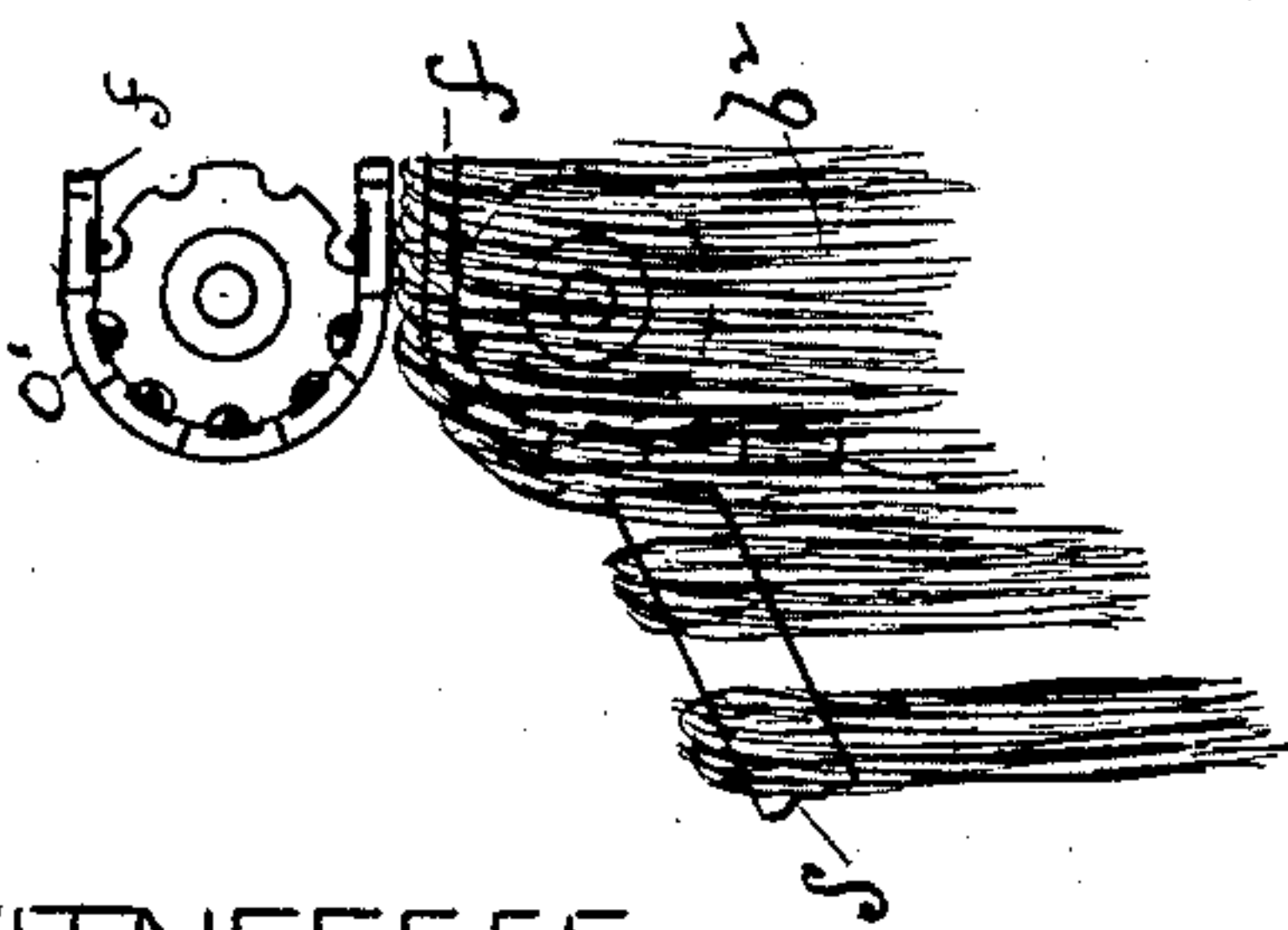


Fig. 1.



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(No Model.)

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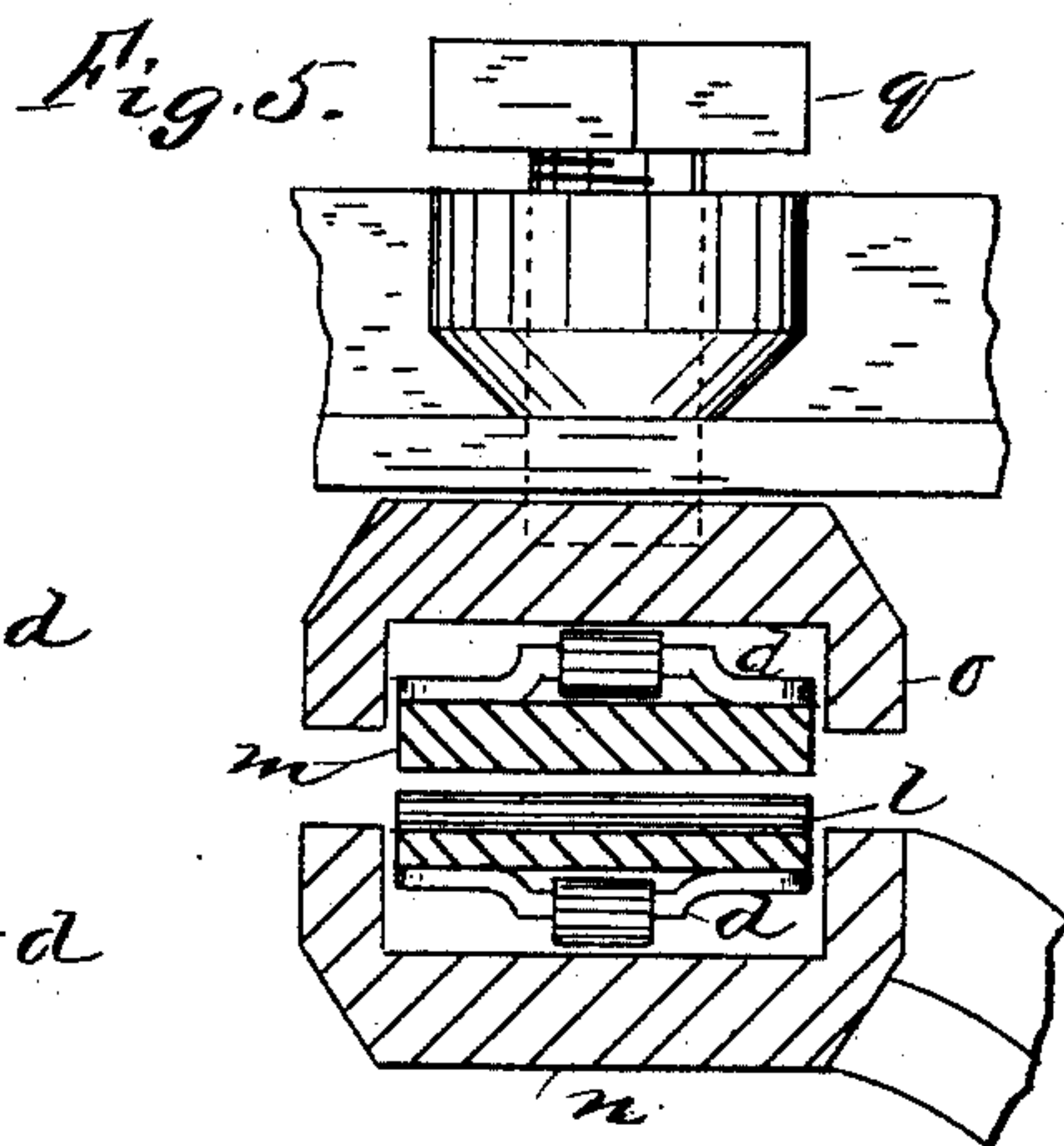
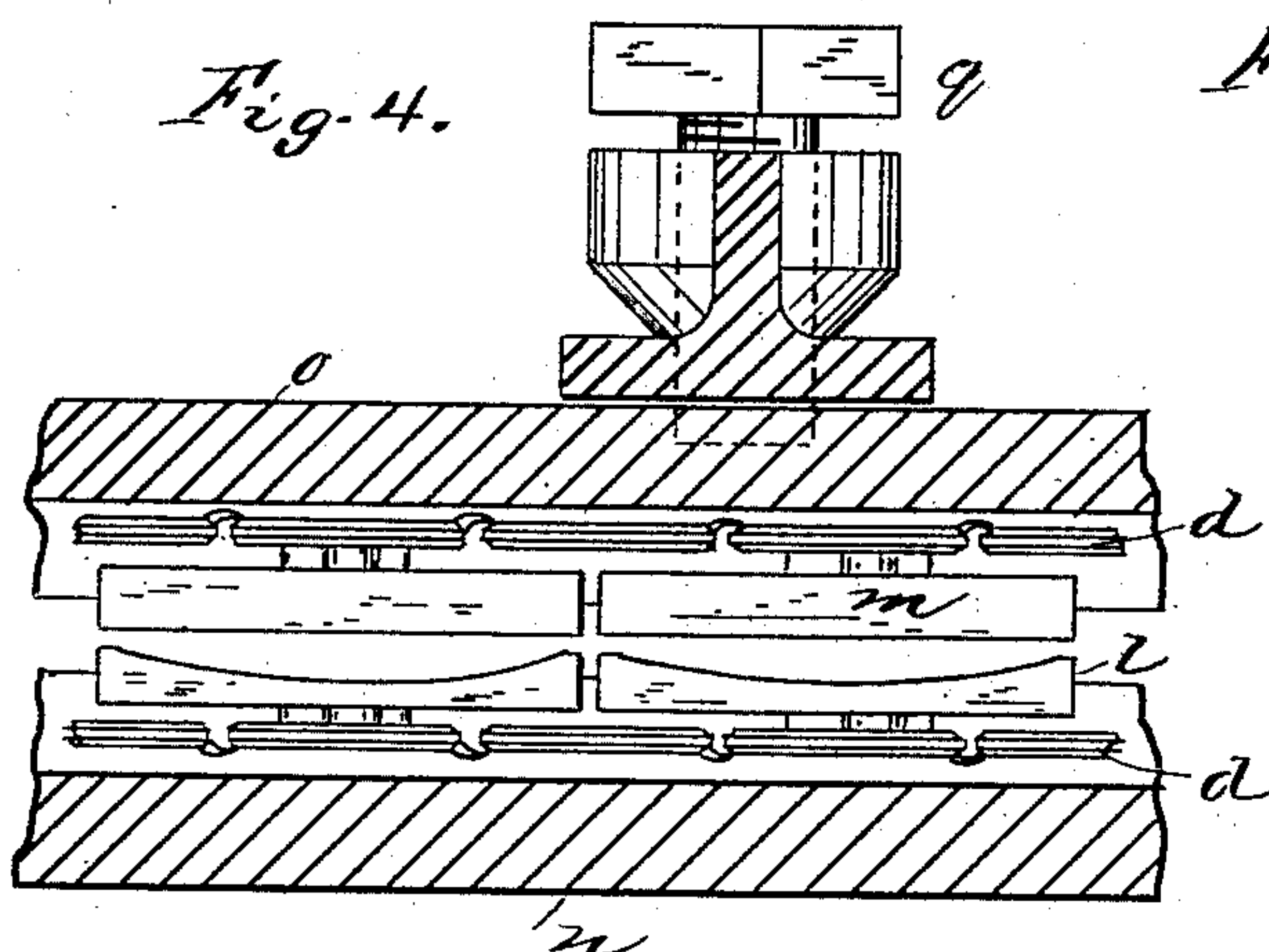
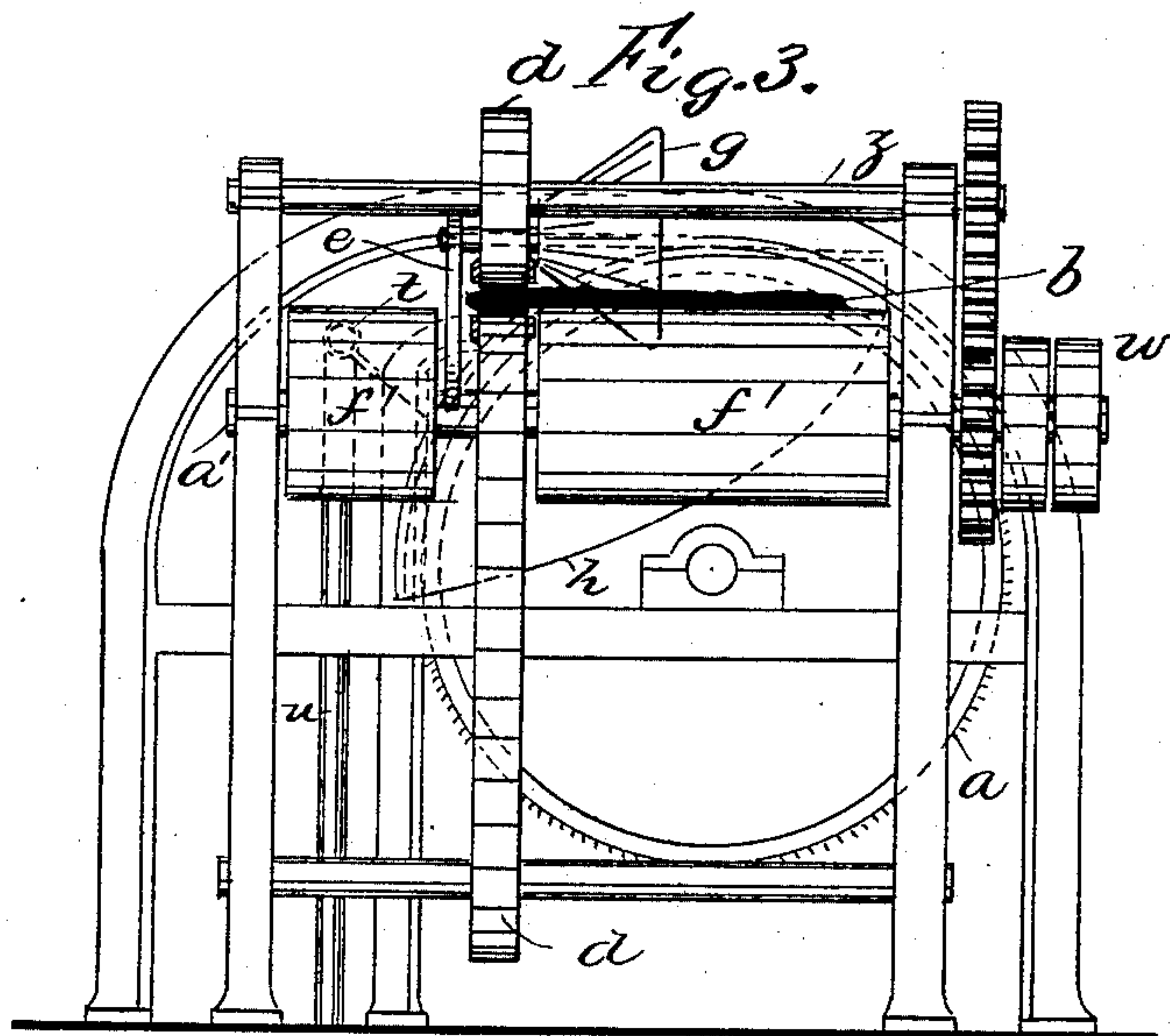
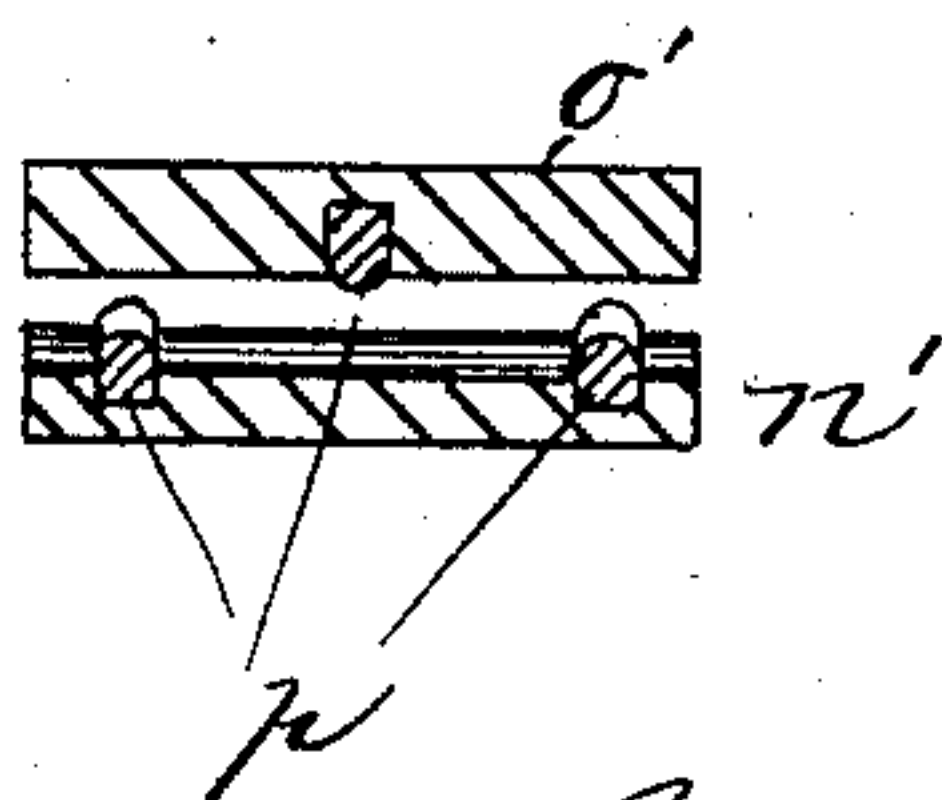


Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN GEORGE STEPHENS, OF BROOKLYN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO DELPHIN E. THEBAUD, OF NEW YORK, N. Y.

METHOD OF CLEANING AND SEPARATING THE PULPY MATTERS FROM THE FIBERS AND LEAVES OF PLANTS.

SPECIFICATION forming part of Letters Patent No. 328,355, dated October 13, 1885.

Application filed January 14, 1885. Serial No. 152,934. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN GEORGE STEPHENS, a subject of the Queen of Great Britain, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in the Methods of Cleaning and Separating the Pulpy Matters from the Fibers of Leaves and Plants, of which the following is a specification.

My invention consists of an improved method of removing the pulpy or fleshy matters of the stalks and leaves of fiber-producing plants—such as henequin or sisal, istle or tampico, pita, hemp, and others of like character—by which the said fibers can be cleaned, separated, and prepared with great rapidity, and at the same time be more thoroughly cleaned, and be left in a better natural condition for industrial purposes and with less waste of the fiber than as heretofore prepared.

My improved method of operation consists in suspending the leaves, stalks, or other fiber-bearing substance in front of a rapidly-moving combing or carding cylinder or belt clothed or armed with fine sharp teeth, pins, bristles, or studs of any approved form, adapted for carding or combing, as distinguished from scraping and scutching, and running downward along the fiber-bearing substance, which is suspended in such manner that the teeth of the card or comb are made to run lightly against the same and rapidly cut and comb away the pulp therefrom, preferably beginning at the lower end and gradually working upward along the whole range of the suspended part, so as to cause but little stress and no crushing, breaking, or tearing effect whatever on the fiber as when scraped; and the essential feature of the mechanism employed consists of said carding cylinder or belt adapted for thus carding or combing away the pulpy matters and provided with contrivances for conducting the fiber-bearing leaves, stalks, or other objects to and side-wise along the combing or carding device and away therefrom in a manner to enable the work to be accomplished rapidly, all as hereinafter described, reference being made to the accompanying drawings, in which—

Figure 1 is a side elevation of a machine

suitably contrived for carrying out my improved method of cleaning and separating fibers. Fig. 2 is a plan view of the same. Fig. 3 is an end elevation. Fig. 4 is a longitudinal section of a portion of one of the guide-ways and side elevation of part of one of the grip-chains for feeding the leaves, stalks, and other parts. Fig. 5 is a transverse section of Fig. 4. Fig. 6 is a transverse section of the grip-jaws for feeding the partly-dressed leaves; and Fig. 7 is a detail of the contrivance for the discharge of the dressed fibers from the machine.

The method now in use of disintegrating fiber-bearing leaves and plants and cleaning the pulpy matters away from the fibers consists of first crushing the pulpy substance, then scraping away the pulp as much as it can be removed in that manner, and finally or simultaneously washing away the fiber to remove the rest of what may be sufficiently disintegrated by the crushing and scraping to be so removed; but the scraping is not as effectual as is desirable in that the pulpy matters lying between the fibers cannot be scraped away, and it is also objectionable because many of the fibers are cut or broken apart by the edges of the scrapers and wasted with the pulp, and those fibers that are naturally round, and particularly the round and tubular fibers, such as are obtained from the henequin plant, are materially injured by the crushing and flattening effect of the scrapers. The scraping process is also slow and demands excessive power; hence I have contrived the method of combing or carding the pulpy matters by means of teeth or pins of sufficient fineness to work into the pulpy matters and between the fibers in a much easier, more effectual, and less injurious manner, as follows:

For cutting away the pulp I employ an ordinary carding-cylinder, *a*, except that I prefer to have the pins or teeth of larger dimensions and stronger capacity than are used in cotton or wool machinery for green leaves, and preferably of angular form in cross-section; but for retted or chemically-treated leaves I may use fine wires or bristles; and I suspend the leaves or stalks *b*, containing the fiber, in front of that side of the cylinder or

belt that runs downward, and move them side-
wise along the same suitably for combing
away the pulp from the fibers which remain
suspended, so that the teeth of the card or
5 comb run freely between the fibers and thor-
oughly cut and carry away the pulp and clean
the fibers effectually without pulling and
straining, tearing, or crushing them, the leaves
or stalks being free to be forced away from
10 the points of the teeth and escape the tensile
strain by the lateral thrusts of the teeth in
case the resistance of the pulp is too great for
the strength of the fibers.

For the purpose of causing the carding-
15 teeth to begin at the lower ends and gradually
work upward along the leaves or stalks as the
fibers are freed from the pulp below the point
or points of action of the teeth on the pulp,
to prevent clogging and straining the fibers,
20 and thus enable the teeth to work freely in
the pulp, and also to facilitate the application
of the leaves to and removal of them from the
card, I cause the leaves to move sidewise along
in front of the cylinder, and employ a shield-
5 ing-apron, *b'*, between the hanging leaves and
a portion of the cylinder, and being so shaped
that it fends off the leaves except at the lower
end at first, and allows them to gradually
touch higher up the card as they move along
0 until the leaves are dressed nearly to the grip-
clutch by which they are suspended and car-
ried.

To begin with, the leaves or stalks are
clutched in the carrying-chains *d* by the stems
5 or butts to be suspended in front of the card
a, so that the stems or butts and some portion
of the leaves or stalks will be carried above
the reach of the card, and consequently will
not be dressed. For dressing these portions
6 I employ another carding or combing cyl-
inder, *e*, and other grip-chains, *f*, contrived for
transferring the partly-combed leaves, stalks,
or other portions of plants being treated from
grip-chains *d* to chains *f*, and presenting the
5 uncombed portions to the card *e* suitably for
completely removing the pulp the whole
length of the leaves or plants and leaving the
fibers clean from end to end. Thus it will be
seen that the pulp is cut and combed away
7 from the fibers in a manner almost wholly re-
lieving them from tensile strain, and therefore
avoiding the severe strains to which they are
subject by a stripping process, and wholly
avoiding the crushing effect to which they are
; subject in the common method of first crush-
ing the pulp and then scraping it from the
fibers; hence I economize largely in the yield
of fiber by not breaking and carrying por-
tions away with the pulp, and I have the much
greater advantage of getting the fiber out in
its natural round or nearly round shape, in
which condition its utility for industrial pur-
poses is far greater both in strength and form
than when flattened by the crushing, rubbing,
and scraping process.

This method of combing away the pulp from

the leaves suspended in front or at the side of
the card-cylinder is also highly advantageous
in respect of the more economical expendi-
ture of power required to do the work, which 70
results from the more natural action and con-
sequently easier operation of the mechanism.
It will also be seen that by rapid action of the
card-cylinders the pulp is cut away in very
fine particles with but slight stress upon the 75
fibers, enabling the work to be done so quickly
that the limit of speed at which the machine
may run is not dependent upon the effect on
the fibers so much as on the capacity of the
mechanism for high speed, from which it re- 80
sults that the rate of progress is vastly greater
by this method than by any other known
method. Practically, it is governed mainly
by the ability of the attendant to supply the
leaves or stalks to the machine. 85

For supplying the leaves or stalks to the
grip-chains *d*, by which they are fed along the
cylinder *a*, I arrange a horizontal endless feed-
ing-apron, *f'*, on the table level with the up-
per surface of the lower feeding-chain, *d*, suit- 90
ably to receive the leaves or stalks on it from
the attendant, and carry them so that the
stems or butts will pass along over that por-
tion of said lower chain that extends beyond
the upper one, and will pass between and be 95
gripped by the two chains, to be held thereby
and be carried along the card-cylinder.

The feed-apron *f'* may consist of two parts,
as here shown, one on each side of the chains
d, or it may have only one part, and be lo- 100
cated on the side along which the main body
of the leaf or stalk is placed, as shown. Said
apron terminates a little beyond where the
leaves enter between the two chains to allow
the leaves or stalks to drop and hang verti- 105
cally from the chains, and a depressing-roller,
g, is located at a suitable position for pressing
them down in case they are naturally too stiff
to drop or become so by drying. If the leaves
are too rigid to be thus bent downward, they 110
may be crushed by passing them through
crushing-rolls of any approved kind—as, for
instance, such as are used for crushing sugar-
cane—previous to being supplied to the feed-
ing mechanism; but the feeding-chains may 115
be contrived to receive the leaves vertically
and so that the leaves will hang naturally
whether stiff or not.

The crushing-rolls may be fluted or corru-
gated, if desired. 120

The chains are located more or less back of
the extreme front of the card-cylinder, accord-
ing as the length of the leaves or stalks or
other conditions require for the length of the
range of the card-teeth along them, and the 125
curved guide *h* is employed to conduct or
guide the dependent portions of the leaves
around the end of the cylinder to the front of
the same and onto guard *b'*, that graduates
the contact of the card-teeth and the leaves. 130

The partly-dressed leaves or stalks are car-
ried past the end of cylinder *a* and along an-

other curved guide, *i*, up which the dressed portions of the fibers are drawn onto another endless feeding-apron, *j*, along which the chains *d* are made to overlap the chains *f* at a suitable distance therefrom and in such relation that as the fibers are drawn up on the apron *j* they will be drawn in between chains *f* at such distance from the pulp remaining on them that the stems which escape from chains *d*, after the fibers are gripped by chains *f*, will fall down after escaping from the end of apron *j* and hang by the fibers, to be dressed by the card-cylinder *e*, running in the opposite direction to that of cylinder *a*, and to the front of which the stems are guided by the curved rod *k*. This cylinder may also have a shield in front of a portion of it, if desired, to graduate the action of the card-teeth, as in the case of cylinder *a*. After passing this cylinder the fibers are discharged from between the chains *f* at the end of their range to be baled or otherwise disposed of. They fall so as to be caught by the loop on an inclined rail, *s*, suitably contrived to receive and conduct them to the receptacle.

In practice I propose to graduate the teeth, pins, or cutters of the carding-cylinders by arranging coarser and stronger ones for the earlier and grosser portion of the work, and finer and closer teeth along the cylinders in the direction the machine passes them.

For enabling the feeding-chains to grip the leaves or stalks and hold them securely against the pull of the card-teeth, I attach to or construct the chains with a series of clutches consisting of gripping jaws or blocks *l m*, suitable for working together in pairs by closing coincidently on the stems, as in the case of chains *d*, or on the fibers as in case of chains *f*, where the stems or fibers, are fed in between the chains, the clutches being confined between grooved guides *n o*, along which they run to maintain the grip, and to enable the chains to resist the pull of the card-teeth on the leaves or fibers. The gripping-faces of these jaws may be variously shaped and otherwise fitted for adapting them to hold the different kinds and forms of leaves, stems, and other parts of the fiber-bearing substances to be treated. For instance to grip the stems, the lower jaws, *l*, may be grooved transversely in concave or V shape, and the upper jaws may be flat or convex, or similar to the form of the lower jaw, and the surfaces may be plain or roughened, or may have leather, rubber, or other approved lining or facing adapted to hold more firmly than the metallic surfaces of the jaws, or the jaws may be made wholly of other material. For the jaws *n' o'*, by which the dressed fibers are to be gripped, the faces should have more elastic cushions or pads of rubber, *p*, specially adapted to bind the individual fibers so that none will fail of being securely held.

Other means of feeding the leaves and stalks along the cylinders may be employed, if pre-

ferred, and I do not limit myself to the particular feeding mechanism herein represented, nor do I limit myself to the employment of the second cylinder for dressing the stems and butts, because by contriving the apparatus so as to dress the leaves and stalks close up to the ends of the stems or butts the undressed portions may be cut off and thrown away, or they may be dressed off by subsequently running the partly-dressed leaves or stalks along the one cylinder or belt employed for the first dressing, the leaves or stalks being presented to the feeding-chains in reverse of their first position, so as to be gripped this time on the cleaned fibers, as when received by the chains *f*; but it is best of course to employ the two cylinders and the transferring feeding mechanism, substantially as herein shown.

The upper guides of the feeding-chains are contrived to be adjusted with set-screws *q*, to regulate the pressure of the clutches on the leaves, stalks, or other parts.

When the leaves, stalks, or other parts of plants are dry and hard, it may sometimes be desirable to lubricate the card-teeth with water, for which I arrange one or more pipes, *t*, having numerous jet-orifices or nozzles, *v*, suitable for the purpose, along the front of one or both of the cylinders, and having a suitable supply-pipe, *w*, for discharging fine jets on the cylinder and the leaves while the work is in progress.

The power may be applied to the feeding-chains in any approved way for working them; but in this case I have represented the fast and loose pulleys *w* for the driving-belt geared by the pinion *x* with the shaft *y* of the feeding-apron shaft *f'*, by which said apron turns shaft *a'*, which drives the lower chain, *d*, and said shaft *y* is also geared with the upper chain-shaft, *z*. These chains *d* turn the shafts *c'* and *d'*, which are also geared together. Shaft *d'* drives the upper chain, *f*, and shaft *c'* drives the feeding-apron *j*, which drives the lower chain, *f*. The depressing-roller *g* is turned by a belt, *e'*, from a pulley on shaft *y*.

It is to be noted that the teeth or pins of the carding cylinder or belt give lateral movement to the portions of the leaves and fibers having contact therewith and move them along even with the parts carried in the chains by the side push which the pins give the fibers while running rapidly along and between them, and from where the pins enter between the fibers they run along the whole of the rest of their length, and pass from between them at the ends, carrying away all the detached particles of matter and keeping the fibers straight and separate from or parallel with each other.

Although I have represented and described the application of the leaves or plants so that the points or upper ends as they grow are dressed first, I do not mean to be limited in this respect, as it is only the preferable way. The stems or butts may be dressed first,

if desired; but I reserve the apparatus or machinery for a separate application for a patent.

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

1. The method of separating the pulp of fibrous leaves, stalks, and other parts of vegetable substances from the fibers thereof by carding or combing the same from the said substances suspended in front of, that is to say, the descending side of a carding cylinder or belt, having combing or carding teeth, pins, or bristles, substantially as described.

2. The method of separating the pulp of fibrous leaves, stalks, and other parts of vegetable substances from the fibers thereof by carding or combing the same from the said substances suspended in front of the descending side of a carding cylinder or belt having combing or carding teeth, pins, or bristles and caused to move along the same, substantially in the manner described.

3. The method of separating the pulp of fibrous leaves, stalks, and other parts of vegetable substances from the fibers thereof by carding or combing the same from the said substance suspended in front of the descending side of a carding cylinder or belt having combing or carding teeth, pins, or bristles and caused to move along the same, and also caused to touch or have contact with the card or comb at one end first and to gradually increase the range of the contact therefrom along the leaves and the cylinder, substantially as described.

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

JOHN GEORGE STEPHENS.

Witnesses:

W. J. MORGAN,

S. H. MORGAN.