(No Model.) 6 Sheets—Sheet 1.

J. R. ABBE.

Paper Pulp Engine.

No. 238,545. Patented March 8, 1881.

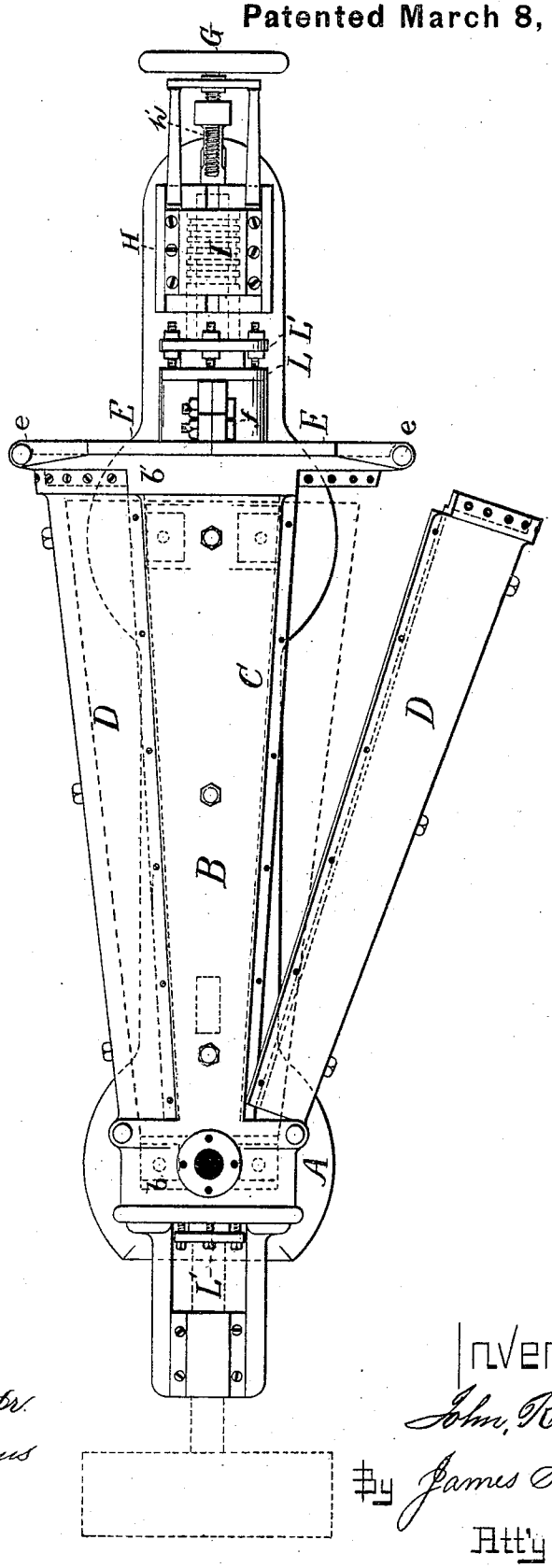


FIG 1.

Witnesses
John Edwards Jr.
Edwin Magnus

Inventor
John R. Abbe.
by James Shepard
Atty

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.) 6 Sheets—Sheet 2.

J. R. ABBE.

Paper Pulp Engine.

No. 238,545. Patented March 8, 1881.

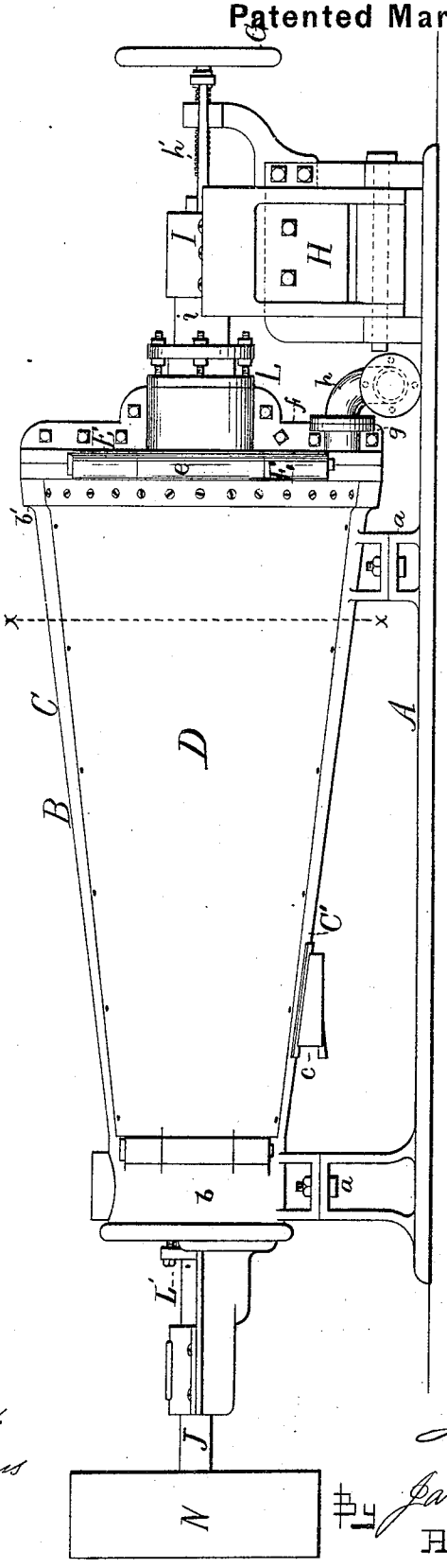


FIG 2

Witnesses
John Edwards Jr.
Edwin Magnus

Inventor
John R. Abbe.
James Shepard
Atty

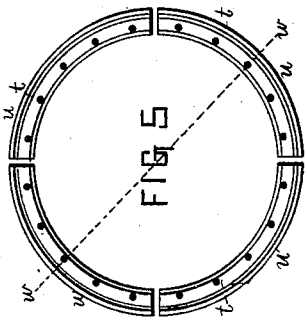
N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

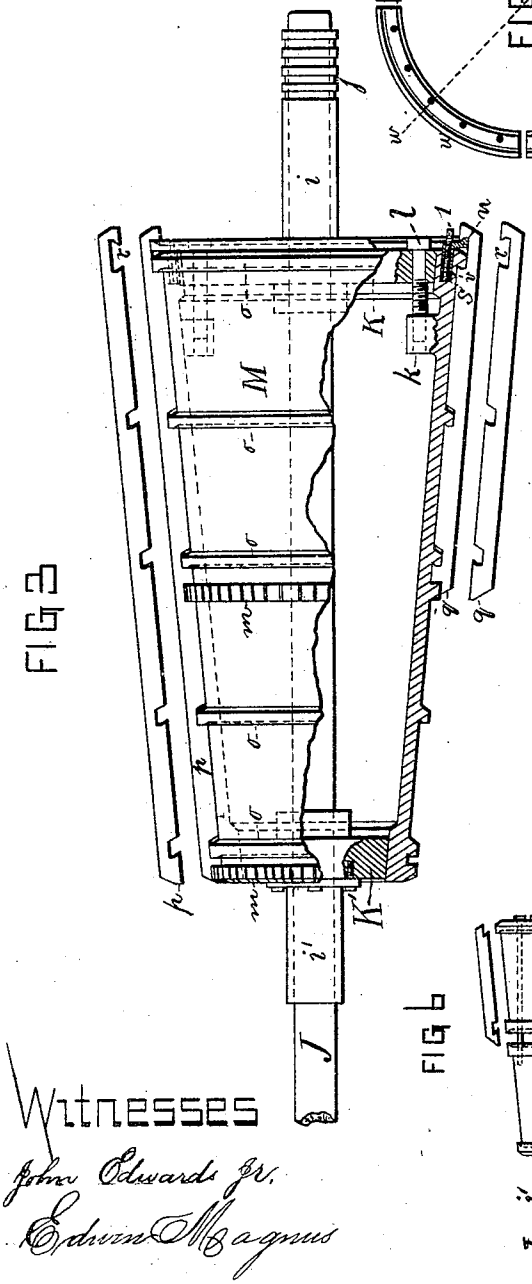
(No Model.) 6 Sheets—Sheet 3.

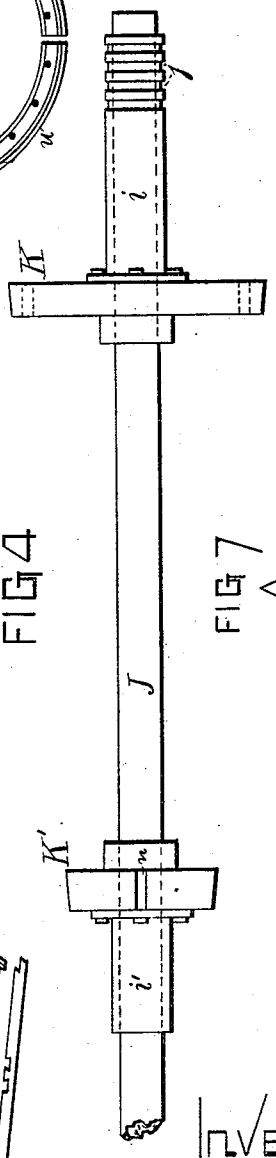
J. R. ABBE.

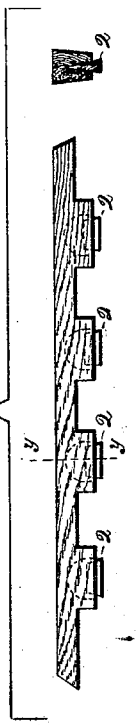
Paper Pulp Engine.

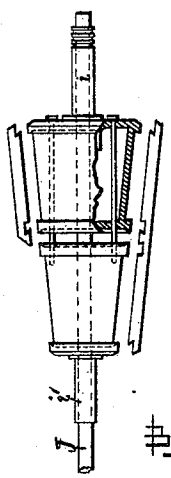
No. 238,545. Patented March 8, 1881.











Witnesses

John Edwards Jr.

Edwin Magnus

Inventor

John R. Abbe

By James Shepard

Att'y

N. PETERS PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.)

6 Sheets—Sheet 4.

J. R. ABBE.

Paper Pulp Engine.

No. 238,545. Patented March 8, 1881.

FIG 8

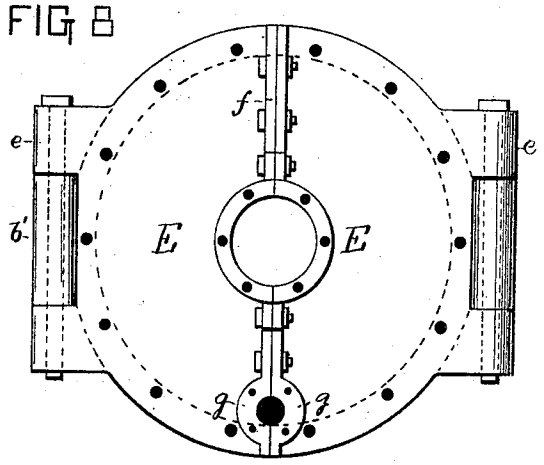


FIG 9

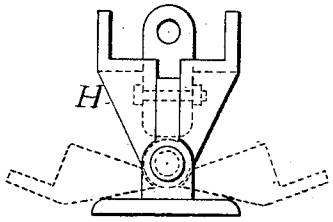


FIG 10

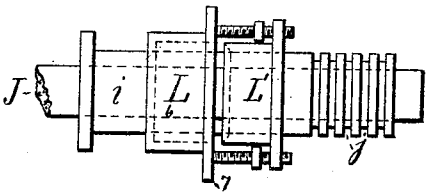


FIG 11

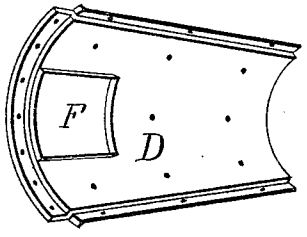


FIG 12

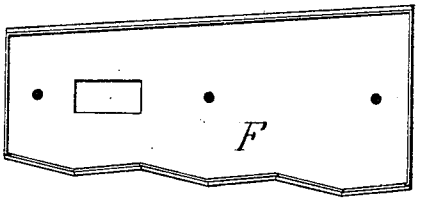
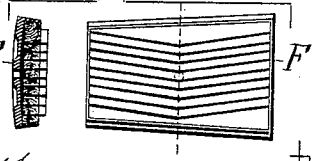


FIG 13



Witnesses

John Edwards Jr.

Edwin Magnus

Inventor

John R. Abbe.

By James Shepard

Atty

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.) 6 Sheets—Sheet 5.

J. R. ABBE.

Paper Pulp Engine.

No. 238,545. Patented March 8, 1881.

FIG 14

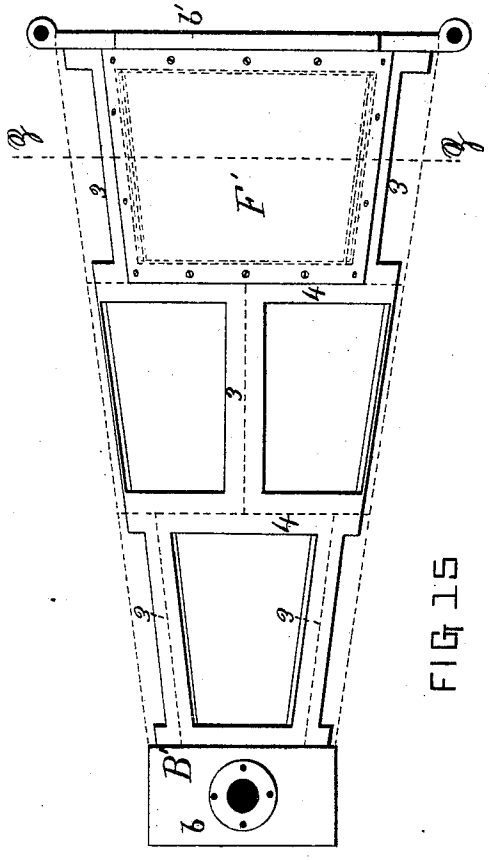
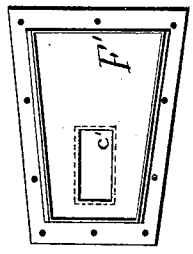


FIG 15



Witnesses
John Edwards jr.
Edwin Magnus

Inventor
John R. Abbe,
By James Shepard
Atty

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.) 6 Sheets—Sheet 6.

J. R. ABBE.

Paper Pulp Engine.

No. 238,545. Patented March 8, 1881.

FIG 16

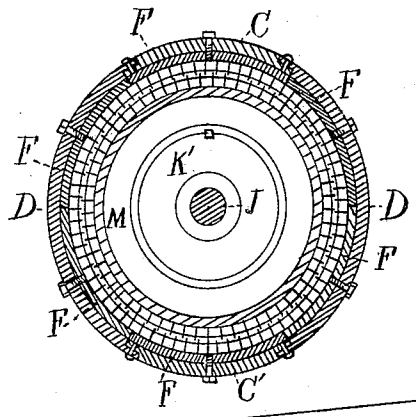


FIG 17

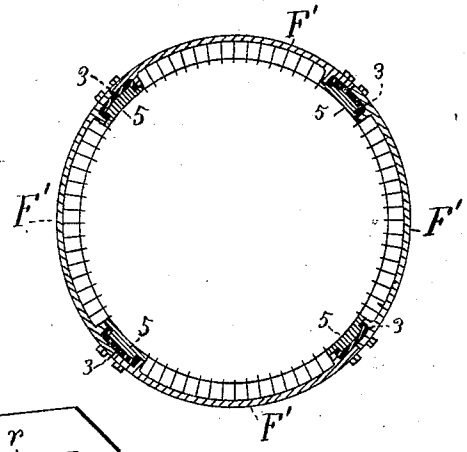


FIG 18

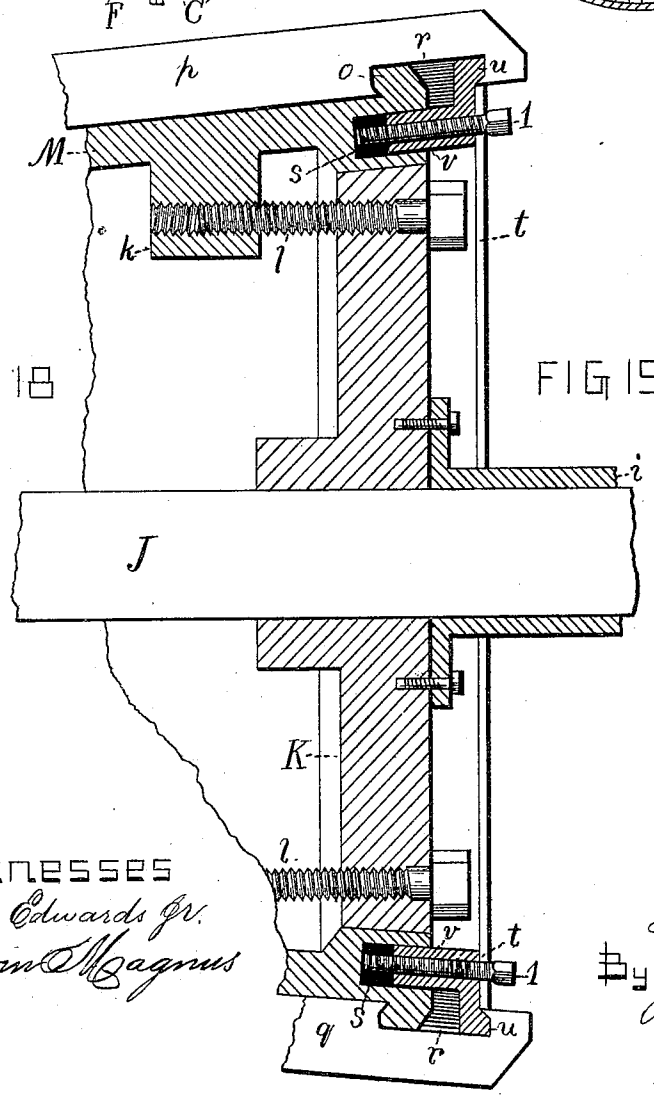
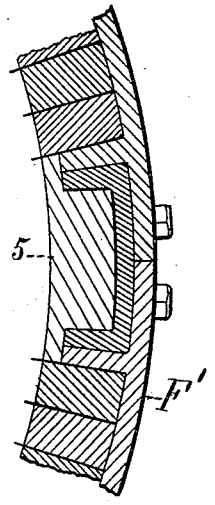


FIG 19



Witnesses
John Edwards Jr.
Edwin Magnus

Inventor
John R. Abbe.
By James Shepard
Atty

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN R. ABBE, OF SOUTH WINDHAM, CONNECTICUT.

PAPER-PULP ENGINE.

SPECIFICATION forming part of Letters Patent No. 238,545, dated March 8, 1881.

Application filed February 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. ABBE, of South Windham, in the county of Windham and State of Connecticut, have invented certain new and useful Improvements in Paper-Pulp Engines, of which the following is a specification.

My improvements relate to paper-pulp engines in which the female circle of knives are secured in gangs to plates, and said plates are secured to a skeleton frame or shell having doors or openings which admit the plates and knives; also, in which the respective members may be made in duplicate parts, and in which various details of construction and new devices and combinations are employed for placing and holding the knives in the cone, for expanding the woods which are placed between the knives, for hanging the shell of the cone, for forming an independent and detachable packing-box, for connecting the cone with the adjustable box, for removing the cone from the shell, for better supporting the whole machine, and for various other purposes.

The main of objects of my improvements are to render the machine much more convenient for use, more simple in construction, more easily put together, taken apart, and repaired, more durable and substantial, and to enable unskilled persons to alter and repair it, so that it may be changed for different uses or repaired by ordinary workmen at the mill without having to send it away. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the skeleton-frame or outer shell and bed-plate, showing one portion of the frame swung open and indicating, also, the position of the cone, its shaft, and pulley, in broken lines. Fig. 2 is a side elevation of the complete machine. Fig. 3 is a side elevation, partly in section, showing the cone and the manner of attaching the knives thereto. Fig. 4 is a side elevation of the cone-shaft, sleeves, and heads for centering and supporting the cone-shell or cone proper. Fig. 5 is a plan view of the segmental wedges or binders for bringing the knives into position on the cone and holding them in place. Fig. 6 is a side elevation, partly in section, showing a modified form of cone and manner of attaching the knives thereto. Fig. 7 is a side elevation and section, on line *y y*, same figure, of the wood filling for placing between the knives. Fig. 8 is an elevation of the hinged head of the skeleton-frame. Fig. 9 is an elevation of one end of the hinged standard for supporting the adjustable shaft-box. Fig. 10 is an elevation of one side of the packing-box, the cone-sleeve, and shaft. Fig. 11 is a perspective view of one of the hinged sides of the skeleton-frame, also showing one of the knife-plates secured thereto. Fig. 12 is a plan view of the inside of a long plate for holding the knives. Fig. 13 is a plan view and section of a short plate for holding the knives, with the knives secured thereto. Fig. 14 is a plan view of a modified form of skeleton-frame. Fig. 15 is a plan view of the inside of one of the knife-holding plates for use on said skeleton-frame. Fig. 16 is a vertical section on line *x x* of Fig. 2. Fig. 17 is a vertical section on line *z z* of Fig. 14, showing the modification of the skeleton-frame, together with its knife-holding plates and knives. Fig. 18 is an enlarged sectional view of part of the cone and the segmental wedges or binders, the plane of section being indicated by line *u u* in Fig. 5; and Fig. 19 is a sectional view, showing a portion from Fig. 17 on an enlarged scale.

A designates the bed of the machine, which connects the two supports *a a*, Fig. 2, of the skeleton frame or shell B. Said frame is composed of two ends, *b b'*, the larger one of which is of an annular form, as indicated by the broken lines in Fig. 8, two curved bars, C C', one at the top and one at the bottom, and both connected to or cast in one piece with the ends *b b'*, and two hinged sides or plates, D D, also of curved form, and hung by means of any suitable hinge-joint to the small end *b* of the skeleton-frame. The edges of the hinged plates D D, and the parts of the bars C C' and ends *b b'*, which join said edges, are rabbeted so as to lap one over the other and form a better joint; and I prefer to secure the parts together along the line of the joints by bolts, as represented by the bolts and bolt-holes in the drawings.

In the lower curved bar, C', I form a refuse-box, *c*, Fig. 2, into which sand, bits of nails, buttons, or other foreign matter may fall and collect during the grinding process and not in-

jure the knives. Similar boxes for the same purpose have heretofore been employed in solid shells.

The end *b* of the skeleton-frame is closed, except a central orifice large enough to receive the packing-box hereinafter described, while the inner diameter of the large end *b'* is about equal to the largest inside diameter of the skeleton-frame. This large end *b'* is closed by means of a hinged head, E E, made in halves, which are hung to the respective sides of the end *b'* by a pintle-hinge, *e*, or other suitable hinge. I provide the joint or meeting-edges of the halves of the head with right-angular flanges *f*, to receive fastening-bolts, as shown. The head is also bolted to the end *b'* by bolts through the outer circle of bolt-holes. (Represented in Fig. 8.) This head may be rabbeted and let into the end *b'* to form a better joint, if desired. I also cast semicircular flanges *g g* around an opening on the ends of the flange *f*, by which to secure the outlet-pipe *h*, Fig. 2, by bolts through the flanges *g g*.

The skeleton-frame, like the solid shell of ordinary engines, is to be lined with knives, the same extending in a circle around the conical shell, and constituting the female grinder or series of knives. Instead of securing these knives (which may be of any kind in ordinary use) directly to the inside of the skeleton frame or shell, I first secure them, with the ordinary woods between the knives, to detachable plates F, either long or short, each plate holding a gang or gangs of knives. These plates may have lugs or zigzag ribs on their inner surface, by means of which to secure the knives; but so long as the knives are secured to said plates, and can be taken out bodily with them, the particular manner of securing the knives is immaterial. I secure these plates to the inside of the skeleton-frame by bolts running through from the outside into the knife-holding plates F. These plates are so disposed as to line substantially the whole inner surface of the curved bars C C' and hinged plates D D; but some space may be left between the plates, and of course the refuse-box *c* should not be covered. As in other pulp-engines, the gangs of knives should be so disposed as to break joints at their ends. These knife-holding plates, with knives attached, can be secured to the inside of the hinged plates D D by swinging the plates outward on their hinges, as represented upon one side in Fig. 1. An inside view of one of these plates D, with a knife-holding plate attached, is shown in Fig. 11, and a section and plan view of one of the knife-holding plates F is shown in Fig. 13. In the sectional view the edges of the knives are represented as in one plane; but they should be, and in use are, sunk back against the inside of the plate F, and present the same curved line across their edges. The holding-plate represented in Fig. 12 is a long one, and is more particularly designed for the inside of the curved bars C C'. The zigzag edge shows how the edges may, if desired, be formed so as to conform to the bends in the knives and meet each other when put inside the skeleton-frame without leaving so much space between each gang of knives as there would be if the knife-holding plates had straight edges. The knife-holding plates can readily be inserted or removed through the opening made by swinging one of the curved plates D D outward on its hinge. When the cone is in place it may be utilized to assist in presenting and removing the upper knife-holding plate to and from its proper position in the skeleton-frame. When said frame is thus properly lined with knives the several bolts may be inserted, and the skeleton-frame is tight, and ready for use the same as a solid shell. Whenever it is desired to use different knives to cut out the woods between the knives or to gain access to the inside for any purpose, the bolts may be removed from the sides and large end of the hinged plates D D, said plates swung open, and the knife-plates removed and carried to any convenient place to put them in a vise, or to obtain a better light, when the ordinary veneered woods may be chiseled out under the most favorable circumstances, and this without removing the shell proper from its mountings on the bed A or disturbing the cone-heads or bearings in the least. The hinged plates D D also furnish ready means of access to the sand-box for clearing it out whenever desired; but said box may, if desired, be provided with a sliding cover or bottom. The plates D D also furnish access to the cone when placed therein, so that the wood filling may be chiseled out without removing the cone from the shell or disturbing its position in its bearings.

As in ordinary engines of this class the cone-shaft is provided with an adjustable box for imparting an endwise movement to the cone, which box is governed by the screw *h'* and hand-wheel G. I support this adjustable box upon a divided standard, H, made in hinged halves, bolted together and attached to the bed A. An end view of this standard is shown in Fig. 9.

Heretofore it has been customary to attach the adjustable box directly to the cone-shaft J; but I secure the box I to the cone-sleeve *i*, which sleeve fits the main or cone shaft J, and is rigidly secured, by bolts or otherwise, to the cone or cone-head K. This cone-sleeve *i* is provided with grooves *j*, around which the soft-metal portion of the adjustable box I is cast, as in prior machines, except that in the present case the grooves are in the sleeve instead of in the main shaft. The advantage of my construction is that the sleeve *i* may readily be placed in a lathe and turned off true and round whenever it becomes worn. It also saves all wear of the main shaft, as the sleeve revolves with the shaft, and all wear of the bearings comes upon the sleeve instead of the shaft. A like sleeve, *i'*, Figs. 3 and 4, except that it is shorter and has no grooves, is secured to the opposite end of the cone. Another ad-

vantage for these sleeves is that when worn new ones may be ordered and put in their place without being at the expense of getting a new shaft.

The packing-box L (shown best in Fig. 10) has the sleeve *i* fitted to its interior, and the said box is received in the central orifice in the head E E, and is secured by bolts which take into the inner circle of bolt-holes, therein represented. This box is substantially the same as prior ones, except that it is detachable and made separate from the heads—that is, the chamber in the box L for receiving the part L′ has been formed in the head of the shell. I form the box containing said chamber in the part L, which consists of a cylindrical hub, 6, and its flange 7, Fig. 10, and secure the same to the head by bolts, as before described. By my improvement the box may be taken out for repairs; or, if made in duplicate, taken out and a new one inserted without having to get a new head or even disturbing the position of the head to make the necessary repairs. A like attachable and detachable packing-box is placed at the opposite end of the shell.

It is oftentimes desirable to remove the cone for the purposes of repairs or for the purpose of substituting one with thicker knives. In order to facilitate the removal of the cone for any purpose I employ the hinged heads E E, before described. By removing the discharge-pipe, packing-box, and the bolts which secure the halves of the head together and to the end *b′* of the skeleton-frame said halves may be swung open and allow the cone to be withdrawn from the frame; but before taking it out the pulley N should be removed, and the bolts which hold the halves of the standard H together should be taken out and the two halves swung open, as indicated by broken lines in Fig. 9, when there will be no obstruction to the removal of the cone.

Instead of making the cone in the ordinary manner I make it in three parts—viz., two heads, K K′, and the cone-shell M. These heads are secured rigidly, by means of a key or otherwise, to the main shaft J. The peripheries of the heads K K′ are turned to conform substantially to the desired taper of the cone-shell M, and the latter is turned both inside and out, so as to center itself upon said heads. At or near the large end of the shell, and upon the inside, I form a lug, *k*, provided with a threaded bolt-hole, into which the bolt *l* is received. This bolt (see Fig. 3) is passed through the head K, and serves to draw the shell firmly upon the heads to center the shell and bind the parts firmly together. I also key the small head K′ to the cone-shell by a key and keyway, partly in the shell and partly in the head, the latter keyway, *n*, being shown in Fig. 4. For the purposes of this part of my invention the knives may be attached to the cone-shell in any ordinary or desired manner.

By the employment of this construction, when a cone having either thick or thin knives is desired, or when, for any purpose, it is desired to change the cone, it can be done by removing only the shell M, with knives attached, and substituting the desired shell, thereby using the same shaft without having to readjust its bearings or boxes or make any other change in the machine except, perhaps, to adjust it in proper lengthwise position within the main shell through the medium of the hand-wheel G and its screw *h′*.

I secure the knives to the cone-shell M or to any cone in the following manner: As in prior cones, several ribs are formed around it to support the knives. I slot the ribs *m* with slots about the width of the thickness of the knives, to steady the knives and to determine their position when putting them into place. The other ribs, *o*, are undercut upon the side which faces the small end of the cone, and preferably have their opposite side parallel to said undercut surface. The long knives *p* and short knives *q* (see Fig. 3) are provided with as many undercut notches as there are ribs *o* within the length of each knife. The notch *r*, which comes at the large end of the cone, is longer in the direction of the length of the knife than the other notches, and is undercut upon both sides, as shown in Figs. 3 and 18.

In the end of the cone I form a recess, *s*, Fig. 18, which extends inward in a direction parallel to the periphery of the cone. If the cone-shell M is employed this recess should be in the end of the shell, so that the knives may be secured independently of the head. I make four or more segmental wedges or binders, *t*, (see Figs. 5 and 18,) the outer edge of which has a beveled rim, *u*, of a shape to fit the outer end of the notch *r* in the knives. These binders *t* are provided at or near their inner edge with a flange, *v*, which fits into the recess *s*. The flange is of such length and the recess of such depth that the bodies of the binders may rest against the end of the shell M. Adjusting or binding screws or bolts 1 pass through the bolt-holes represented in Fig. 5 and through the flange *v*. When these binders rest against the end of the cone-shell the knives can readily be set in place, the notch *r* being long enough to allow the knives to be slipped into place with the last rib *o* and the beveled rim *u* of the binders both entering said notch. The adjusting-screws may then be turned inward to force the binders outward and expand the circle formed by the segmental binders. This will cause the rim *u* to draw the knives endwise and firmly bind all the undercut sides of the several notches in the knives against the undercut sides of their respective ribs, thereby firmly binding the knives in place and securing them from their extreme bottom or inner edge. The knives are not only very rigidly secured in place, but they are so secured in a very convenient manner. Any ordinary workman can readily take out old knives and put in new ones, as occasion requires, without sending for a machinist. If only a few knives

are to be removed it is necessary to loosen but one of the binders. When this cone is used in connection with my skeleton-frame access can be had to the binders and the sides of the cones for changing the knives by means of the hinged plates D D and head E E, so that the shaft and bearings for the cone need not be disturbed at all. The notch *r* I have described as undercut upon both sides, but the undercut side which rests against the rim *u* will hold the knives so firmly that the left-hand side of the notch may be made square with the bottom edge, if desired.

In Fig. 6, I have shown a modification of my plan for securing the knives. The ribs are undercut, and also the notches in the knives; but part of them are undercut in one direction and part in the opposite direction. The cone or cone-shell is divided transversely near the middle of its length, and adjustably secured together by means of bolts passing longitudinally through one part into the other, one part being rigidly secured to the main shaft and the other sliding on a spline. By letting the two parts of the cone separate a little from each other the knives can be set in place. Then, by bringing them together again by means of the bolts, the undercut faces of the ribs and notches in the knives will be forced together to hold the knives, and secure them as firmly as by the plan first described, and at the extreme bottom or inner edge of the knives.

As in ordinary engines veneered woods are placed between the respective knives, and sometimes there is trouble in making them fit as snugly as may be desired. I make these wood fillings of substantially the ordinary form, (see Fig. 7,) except that I form a longitudinal groove—as, for instance, a saw-kerf—through the bottom of the parts which fit in between the ribs, and insert a wedge, 2, or wedges into each groove. In driving the woods into place the wedges will strike the cone and be stopped thereby, so that the woods are expanded between the knives by the wedges as said woods are further driven down, so that they are very firmly seated in place.

In Figs. 14, 15, 17, and 19 I have illustrated a modification of the skeleton-frame B′ and knife-holding plates F′. The skeleton-frame is formed with ends *b b′*, as in the first-described construction, while its sides are provided with longitudinal and transverse bars 3 4, forming openings which break joint at their ends, as shown in Fig. 14. The form of the longitudinal bars in cross-section is shown in Figs. 17 and 19; also that of the knife-holding plates. These knife-holding plates are rabbeted on their edges, and are secured by bolts to the outside of the bars 3 4 and ends *b b′*, as shown. The plate shown in Fig. 15 is provided with a box, *c′*, to receive and collect buttons, nails, and other foreign matter. Knives are secured to the inside of the knife-holding plates F′ in any proper manner. This form of skeleton-frame and knife-holding plates leaves quite a space between each gang of knives. In order to fill this space I employ veneered woods 5, of the form shown in Figs. 17 and 19, which, like the other woods, may be worked down by chipping or splitting off the woods, one veneer or lamina at a time. In this modified skeleton-frame, as well as in that first described, the knife-holding plates and knives can be removed bodily by loosening bolts on the outside of the shell, and thereby the cone is accessible. In both cases there is always a part of the shell left in position, which connects the two ends or heads, so that the relation to the heads and shell is never changed. Both skeleton-frames are adapted for use with all of the other features of my invention herein described.

I am aware that a prior patent for a paper-pulp engine shows a shell made in two longitudinal halves, which may be opened to furnish access to the cone and to the inside of the shell and the knives secured directly to said shell. In a prior patent to myself knives for the inside of the shell are shown and described as arranged in gangs, but not upon knife-holding plates, both of which prior patents are hereby disclaimed.

If desired, my present skeleton-frame may be used without the knife-holding plates by the employment of knives in gangs, connected as described in my prior patent of December 28, 1880; but I prefer to employ the knife-holding plates.

I claim as my invention—

1. The skeleton-frame connecting the two heads of the shell and provided with openings for furnishing access to the interior, substantially as described, and for the purpose specified.

2. The skeleton-frame composed of the parts *b b′* C C′ and the hinged plates D D, substantially as described, and for the purpose specified.

3. In combination with the shell or frame, the head E E, made in halves and hinged to the end of the shell, substantially as described, and for the purpose specified.

4. In a paper-pulp engine, the head made in halves and provided with the flanges *f* and *g*, the latter surrounding the outlet, substantially as described, and for the purposes specified.

5. The standard H, for supporting the adjustable box I, made in hinged halves fastened together, but adapted to swing open when desired, substantially as described, and for the purpose specified.

6. The attachable and detachable packing-box made separate from the shell-heads, but adapted to be secured in the central orifice of said heads, substantially as described, and for the purpose specified.

7. The combination of the main shaft, cone-sleeves *i i′*, rigidly connected so as to rotate with said shaft and cone, but detachable therefrom without disturbing the knives on the cone, substantially as described, and for the purpose specified.

8. The sleeve *i*, having grooves *j*, for securing it in the adjustable box I, and also adapted to be rigidly secured to the cone and main shaft, substantially as described, but detachable therefrom when desired, for the purposes specified.

9. The knife-holding plates with knives secured to their inner side, in combination with the skeleton frame or shell, to which they may be bolted, substantially as described, and for the purpose specified.

10. The skeleton-frame having side openings, in combination with knives secured together in gangs and adapted to be attachably and detachably secured to the frame to form the female circle of knives, substantially as described, and for the purpose specified.

11. The self-centering cone composed of the heads K K′ and separate shell M, and means for drawing the shell on the heads and securing it in place, substantially as described, and for the purpose specified.

12. The cone having a series of undercut ribs, in combination with the knives having undercut notches in their bottom edge, and mechanism for binding the said undercut surfaces together and locking the knives in place, substantially as described, and for the purpose specified.

13. The cone having undercut ribs, in combination with the knives having undercut notches, the segmental binders *t*, and binding-screws, substantially as described, and for the purpose specified.

14. The cone having undercut ribs and the recess *s* at the end, in combination with the knives having undercut notches, binders *t*, having the flange *v* and rim *u*, and the adjusting-screws 1, substantially as described, and for the purpose specified.

15. The combination of the wood fillings, (Fig. 7,) having longitudinal grooves in their bottom edge, the wedges 2, placed in said grooves, the knives, and body to which they are secured for receiving said woods and wedges, substantially as described, and for the purpose specified.

16. The combination of the bed A, supports *a a*, skeleton-frame B, having hinged heads E E, and the divided hinged standard H, secured to the bed A, all substantially as described, and for the purpose specified.

JOHN R. ABBE.

Witnesses:
CHESTER TILDEN,
L. B. HICKS.