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Sheet- 1.

H. Voelter.

Wood Pulp App.

No 55,031. Patented May 22. 1866.

FIG 1.

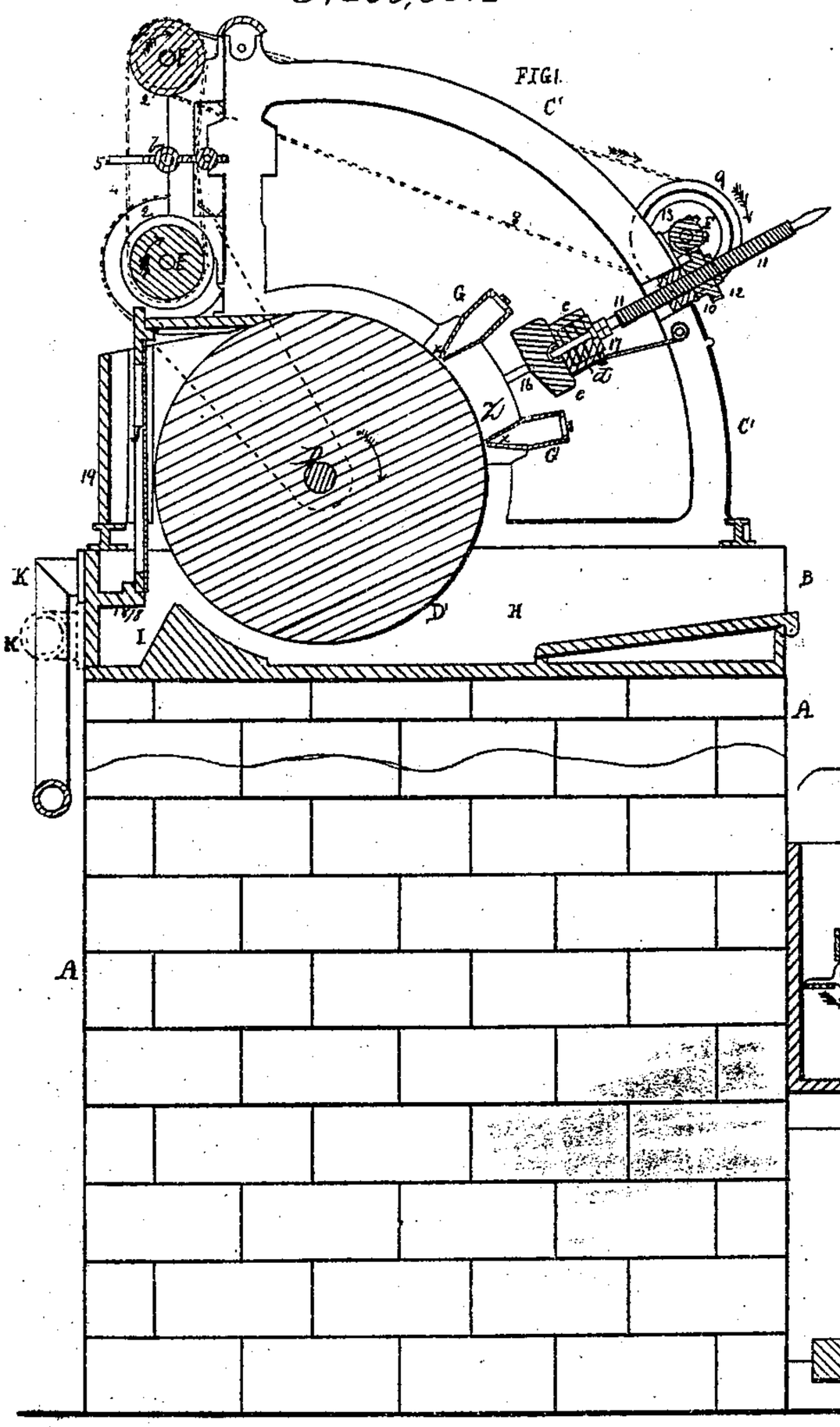


FIG 5.

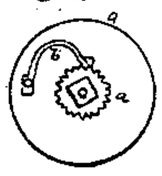


FIG 2

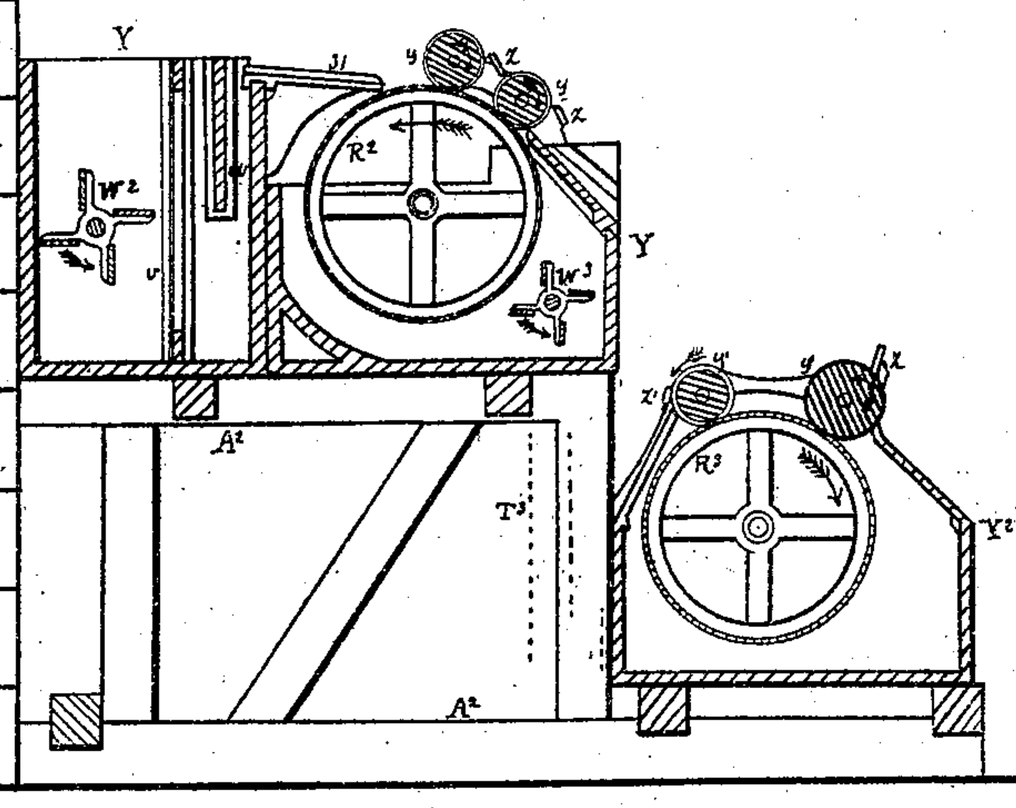


FIG 3.

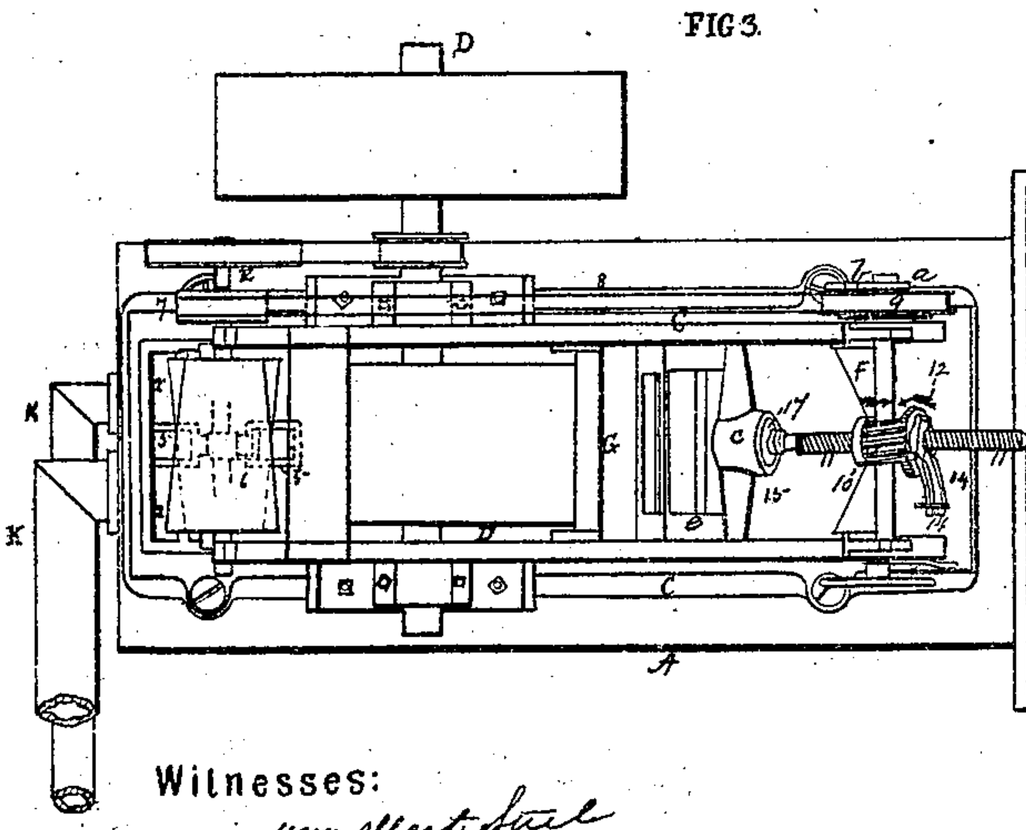
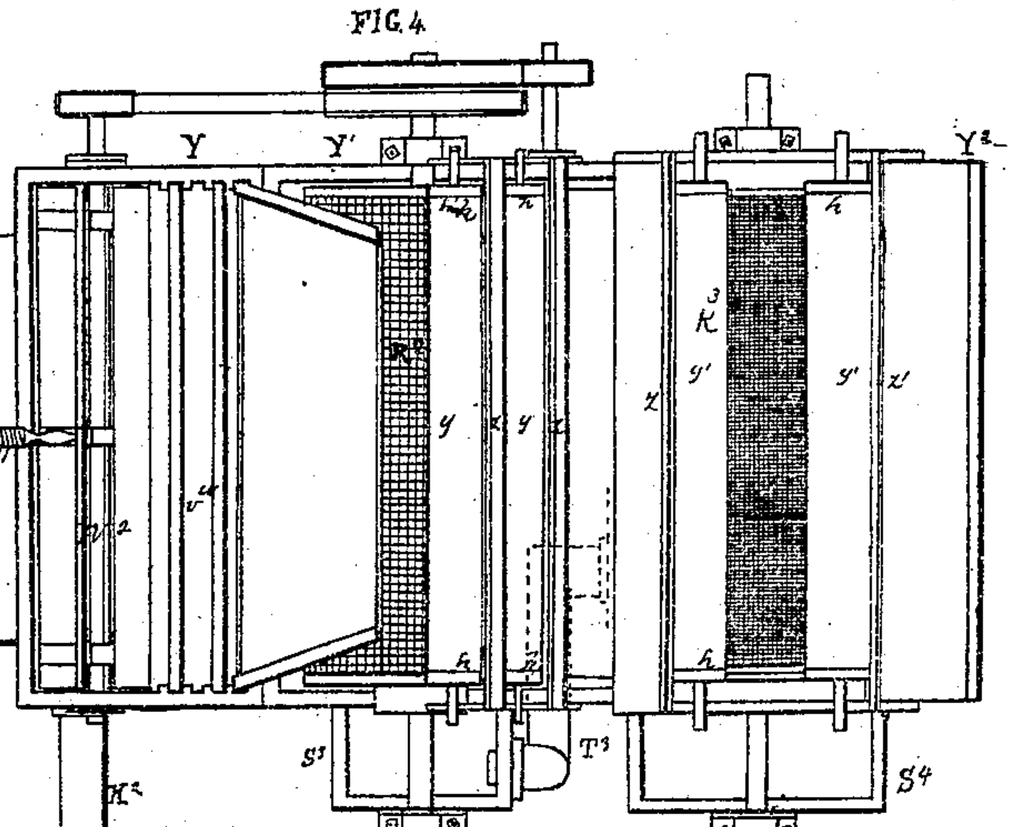


FIG 4.



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By his Atty
H. Howson

2 Sheets.
Sheet. 2.

H. Voelter.

Wood Pulp Apn.

No. 55,031. Patented May 22, 1866.

FIG 6

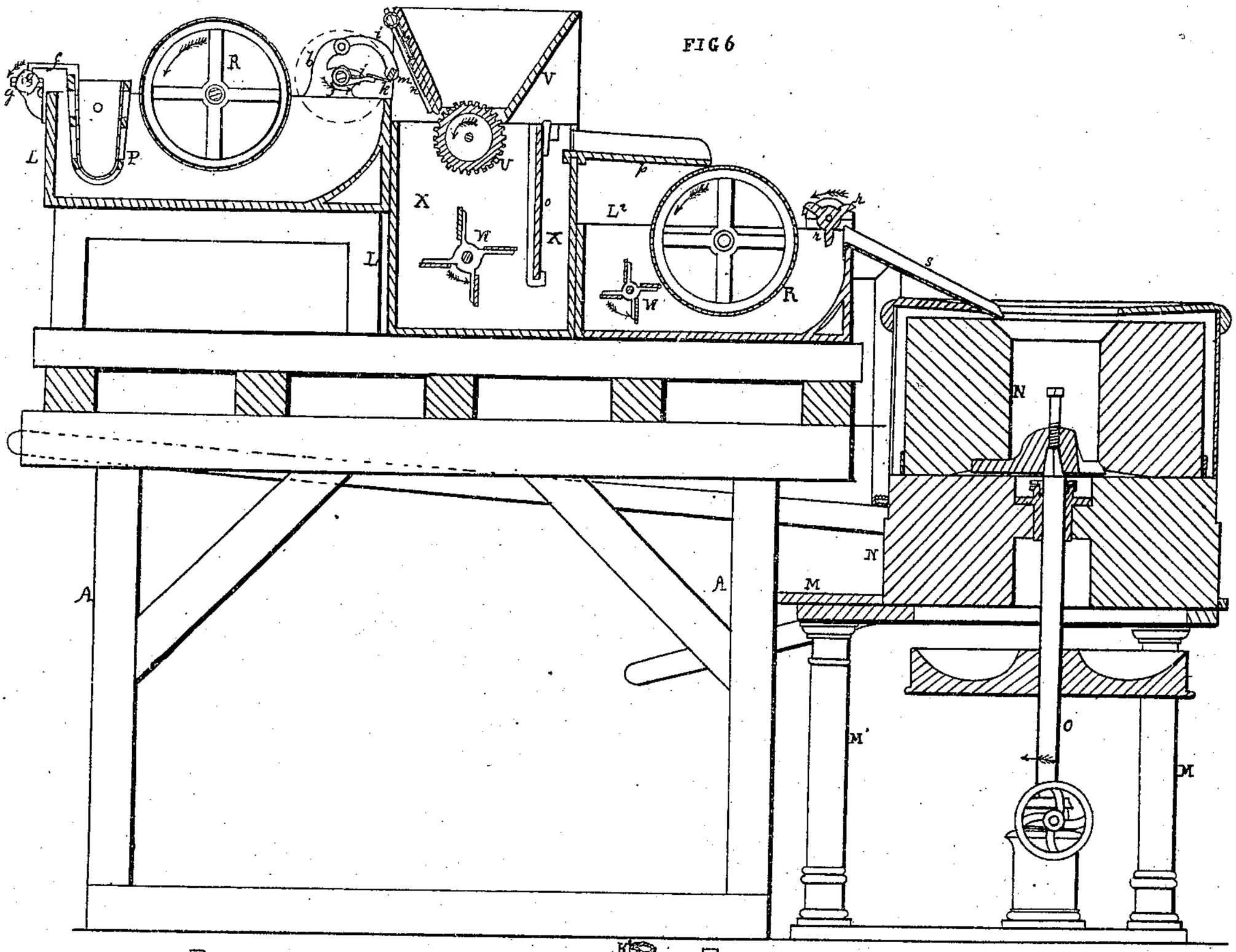
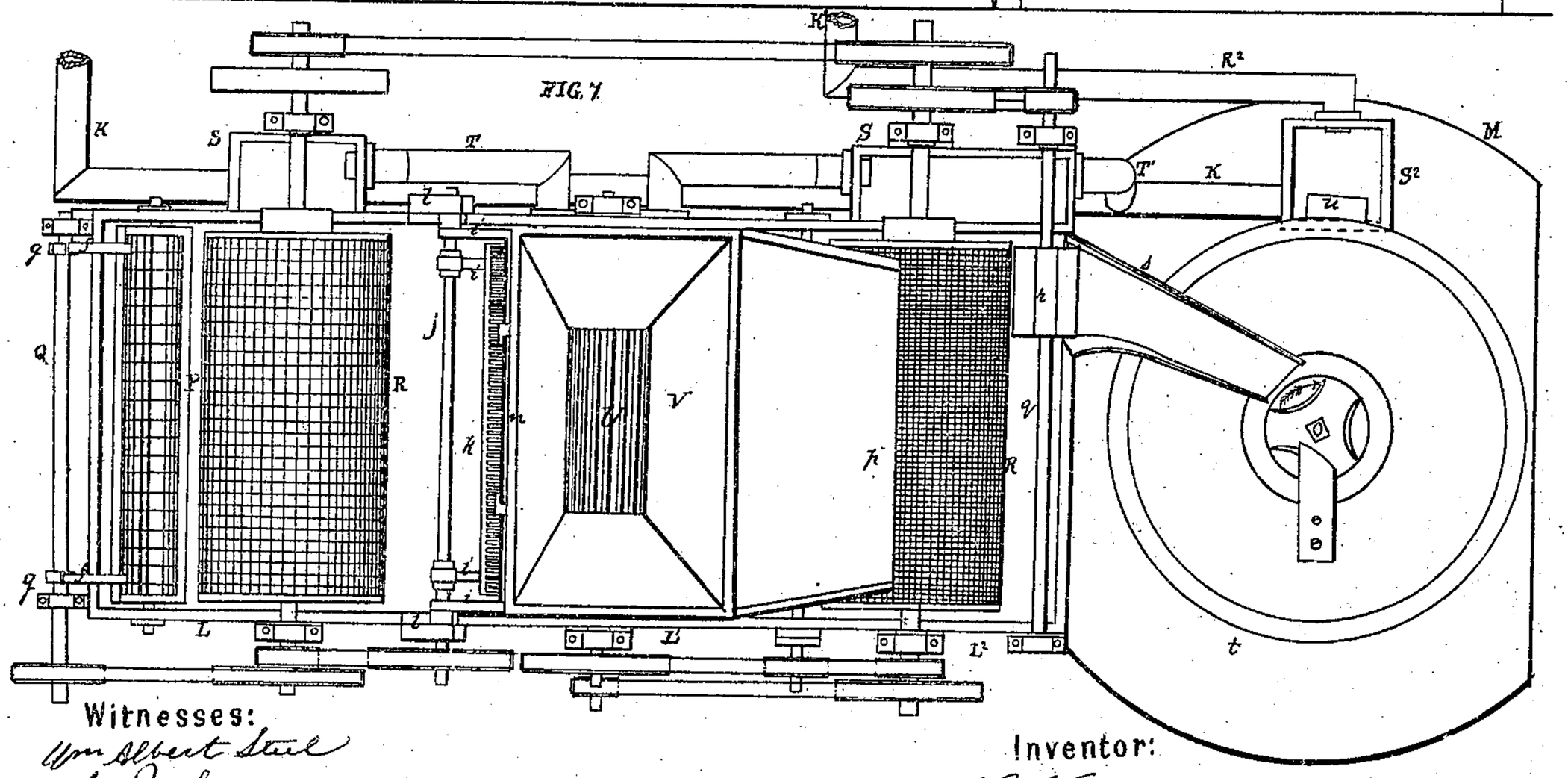


FIG. 7



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UNITED STATES PATENT OFFICE.

HENRY VOELTER, OF HEIDENHEIM, WÜRTEMBERG, GERMANY.

IMPROVEMENT IN REDUCING WOOD TO PAPER-PULP.

Specification forming part of Letters Patent No. **55,031**, dated May 22, 1866.

To all whom it may concern:

Be it known that I, HENRY VOELTER, of Würtemberg, Germany, have invented certain Improvements in Apparatus for Reducing Woody Fibers to Paper-Pulp; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to certain improvements in an apparatus for which Letters Patent of the United States were granted to me on the 10th day of August, 1858, and the said improvements consist in certain devices, constructed and operating substantially as described hereafter, whereby blocks of wood may be thoroughly disintegrated and the fibers thus obtained be assorted in classes according to their different degrees of fineness.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawing, which forms a part of this specification, Figures 1 and 2, Drawing No. 1, are sectional elevations of parts of my improved apparatus for reducing wood fibers to paper-pulp; Figs. 3 and 4, plan views of Figs. 1 and 2; Fig. 5, a detached view of part of the apparatus; Fig. 6, Drawing No. 2, a sectional elevation of another portion of the apparatus, and Fig. 7 a plan view of Fig. 6.

Similar letters refer to similar parts throughout the several views.

On a suitable foundation, A, Fig. 1, rests an oblong box, B, and to opposite sides of the latter are secured quadrant-shaped frames C C′, in which turn the shafts D, E, E′, and F.

To the shaft D is secured a grindstone, D′, and to each of the shafts E E′ is secured a conical pulley, 2, a belt, 4, passing round both pulleys and through the forked ends of a guide, 5, which is adjustable laterally on a screw-shaft, 6.

On the shaft E is a pulley, 7, and on the shaft F turns a pulley, 9, a belt, 8, passing round both pulleys, and to the shaft F, adjacent to the pulley 9, is secured a ratchet-wheel, *a*, to the teeth of which is adapted the end of a spring-pawl, *b*, attached to the pulley 9.

Through an opening in a cross-piece, 10, extending between the side frames, passes a screwed rod, 11, the said rod also passing through a worm-wheel, 12, which bears against the cross-piece, and is operated by a worm, 13, on the shaft F.

To the upper side of the worm-wheel 12 are hung two jaws, which bear against opposite sides of the rod 11, and have threads cut in their edges, the said threads being adapted to the thread on the rod.

To a cross-head, 15, which slides on guides 16, attached to the side frames, is secured a box, *c*, containing a rubber spring or cushion, *d*, and against the latter bears a disk, 17, on the rod 11, which projects through the cushion and through the bottom of the box, a nut on the lower end of the rod preventing the withdrawal of the latter.

To the lower side of the cross-head 15 is secured a wooden block, *e*, the face of which, near the lower edge, is cut away, as shown in Fig. 1, for a purpose described hereafter.

To the side frames are secured two hollow adjustable cross-pieces or boxes, G G′, each of which communicates with a water-reservoir, and in the lower edge of each box, which is nearly in contact with the face of the stone D′, is a narrow slit or opening, *x*. The adjacent sides of the boxes G G′, near their lower edges, are parallel, and are such a distance apart as to permit the ready introduction between them of the block *e*.

A rake, H, extends from the bottom of the box B to one side of the grindstone D′, and at the bottom of the box, below the opposite side of the stone, is a projection, *i*, of the form shown in Fig. 1.

On a shelf or partition, 18, at the end of the box B, rests a sieve, J, the upper portion of which is inclosed by a casing, 19, secured to the side frames and to the edge of the box. Two pipes, K and K′, communicate with this end of the box B, the former above, and the latter below, the partition 18.

On a frame-work, A′, Fig. 6, rest three tanks, L, L′, and L², and in the tank L is hung a basket, P, of wire-gauze or other suitable material, arms *f f*, which project from the said basket, bearing on ratchet-wheels *g*, secured to a shaft, Q, turning in brackets attached to the tank.

In the tank L revolves a cylinder, R, of wire-gauze, which communicates at one end with a reservoir, S, Fig. 7, at the side of the tank, a pipe, T, leading from the said reservoir and communicating with the tank L′, near the bottom of the latter.

To arms *i i*, secured to a revolving shaft, *j*, turning in bearings attached to the tank L, is secured a comb, *k*, and to arms *i i*, hung to

brackets *l l*, is secured a plate, *m*, for a purpose described hereafter.

In the upper portion of the tank L′ turns a shaft on which is secured a fluted or serrated roller, U, and above the latter is a hopper, V, in guides, on one of the inclined sides of which slides a plate, *n*, the lower edge of the latter being parallel to the face of the roller. The tank L′ is divided by a vertical partition, *o*, which extends nearly to the bottom into two unequal-sized chambers, *x x′*, and in the lower portion of the former turns a paddle-wheel, W. From the upper edge of the tank L′ extends an inclined plate or chute, *p*, and below the latter, in the tank L^2, rotates a hollow cylinder, R′, of wire-gauze, which communicates through an opening in one end with a reservoir, S′, Fig. 7, at the side of the tank.

In the lower portion of the tank L^2, below the chute *p*, revolves a paddle-wheel, W′, and to a shaft, *q*, which turns in suitable bearings secured to the tank, is attached a smaller paddle-wheel, *r*, the upper end of an inclined chute, *s*, being secured to the edge of the tank adjacent to the paddle-wheel *r*.

On a platform, M, supported by pillars M′ M′, rests the lower stone, N, of a pair of millstones, the upper millstone, N′, being hung to and rotating with a vertical shaft, O, in the ordinary manner, and into the usual central opening in this stone projects the lower end of the chute *s*. The upper stone, N′, is surrounded by a casing, *t*, an opening at one side of which communicates with a box or reservoir, S^2, secured to the platform M.

On the frame-work A^2, Fig. 2, rest the tanks Y, Y′, and Y^2, and in the former is a vertical sieve, *v*, and a partition, *w*, the latter extending across the upper portion only of the tank. On one side of the sieve *v* revolves a paddle-wheel, W^2, and from the opposite side of the tank a chute, 31, projects over a cylinder, R^2, of wire-gauze, which revolves in the tank Y′.

The cylinder R^2 communicates, through an opening in one end, with a reservoir, S^3, Fig. 4, a pipe, T^3, communicating with the latter and with the tank Y^2, in which turns a cylinder, R^3, which communicates with a reservoir, S^4, and against both this cylinder and the cylinder R^2 bear rollers *y y*, on the ends of which are bands *h*, of leather or other suitable material, a stationary plate, *z*, being secured at the side of each roller. In the tank Y^2 turns a paddle-wheel, W^3.

The pipe K, Figs. 1 and 7, communicates with a pipe, T′, leading from the reservoir S′, and also with the reservoir S^2, and from the latter extends a pipe, K^2, which communicates with the tank Y.

The material flowing through the pipe K′ is discharged into the basket P, a pump or other suitable apparatus being used to elevate the material when the tank L is above the box B.

Operation: The sections *z* of wood to be disintegrated are placed between the boxes G G′ and against the grindstone D′. Water is admitted to each of the said boxes and into the tank B, and a rotary motion in the direction of its arrow is imparted to each of the shafts D, E, E′, and F. A rotary motion in the direction of its arrow is also imparted to each of the shafts Q, *j*, *q*, and O, to the paddle-wheels W, W′, W^2, and W^3, to the cylinders U, R, R′, R^2, and R^3, and to the rollers *y y*. As the worm-wheel 12 is turned the jaws 14 14, acting as a revolving nut, will cause the rod 11 to be moved forward, the block *e* being brought against the sections *z* and feeding the latter slowly toward the grindstone by which they are disintegrated, the fibrous particles thus detached being carried into the box B. The undue pressure of the wood against the stone is prevented by the elastic cushion *d*, which also yields slightly to permit the wood to accommodate itself to inequalities in the stone, while the wedging of the blocks between the boxes G G′, which occurs when the said boxes approach each other toward the bottom, (as in my patented apparatus before alluded to,) is prevented by making the adjacent sides of the boxes parallel. The speed of the forward movement of the rod 11 in proportion to that of the stone is regulated by adjusting the belt 4 on the pulleys 2, the spring-pawl *b*, through the medium of which motion is conveyed from the pulley 9 to the shaft F, being sufficiently rigid to retain its hold on the ratchet-wheel *l* so long as no unusual resistance is offered to the forward movement of the rod 11 and the cross-head. When, however, the blocks of wood are not disintegrated with sufficient rapidity, or the forward movement of the rod 11 is otherwise interrupted or retarded, the pawl *b* will yield and slip over the teeth of the ratchet-wheel, the rattling noise thus produced informing the attendant of the necessity of readjusting the belt 4 to diminish the speed of the shaft F. As the block *e* is brought near the face of the stone that portion of the wood beneath the inclined face of the block will be cut to a wedge-shape, the thick edge being toward the box G′. By this means small particles of wood are prevented from being wedged into the narrow space between the box G′ and the stone, to the retardation of the revolution of the latter. The finer fibers of the wood are carried by the revolution of the stone between the teeth of the rake H, and are thrown against the sieve J, while such coarser particles as would injure the sieve are arrested by the rake. The finest filaments pass through the sieve J with the water thrown up by the stone, and are conducted through the pipe K to the reservoir S^2, Fig. 7, while the larger particles fall in front of the projection I and pass with the water which flows through the pipe K′ into the basket P, Fig. 6. The finer fibers pass through the meshes of the basket P, while the coarser fibers are retained and removed from time to time, such a vibrating motion being imparted to the basket by the action of the ratchet-wheels *g* as will prevent the meshes from becoming obstructed. The finest fibers pass with the water into the gauze cylinder R,

and out of the latter into the reservoir S, and through the pipe T, to the tank L′, the coarser fibers being carried by the action of the cylinder R within range of the rotating comb *k*, by which they are caught and carried upward until the comb strikes the plate *m*. As the comb continues to revolve the plate *m* slides forward and scrapes off the adhering fibers, which fall into any suitable receptacle, the tank L being thus cleared of the useless fibers which would obstruct the action of the cylinder. After the contents of the reservoir S are introduced into the tank L′ they are thoroughly agitated and mixed by the action of the paddle-wheel W, a mash being thus produced, which is directed upward through the chamber X′ and onto the chute *p*, from which it falls onto the cylinder R′. The finer filaments, which pass through the cylinder R′, are conveyed into the reservoir S′, and through the pipe T′ into the reservoir S^2, while the mash which remains in the tank is mashed and agitated by the paddle-wheel W′, and is directed by the paddle-wheel *r* into the chute *s*, down which it flows into the opening in the upper millstone, N′. As the fibers pass between the millstones they are split and broken into fine filaments, the stones being so prepared that the fibers may be cut rather than worn. The fibers, after being reduced to a pulpy mass, pass from the stones into the casing *b* and then into the reservoir S^2. The pulp flows from the reservoir S^2, through the pipe K^2, into the tank Y, where it is directed by the paddle-wheel W^2 against the sieve *v*, the finest fibers passing through the latter and upward to the chute 31, from which they fall onto the cylinder R^2, the fibers which pass into this cylinder being conducted to the reservoir S^3 and through the pipe T^3 to the tank Y^2. The pulp in the tank Y′ is agitated by the paddle-wheel W^3, so that every portion may be brought into contact with the cylinder. The gauze on the cylinder R^3 is too fine to permit any of the fibers to pass through the same. The superfluous water, however, flows into the cylinder and into the reservoir S^4, from which it is removed by a siphon or other suitable apparatus. As the cylinders R^2 R^3 revolve the fibers on the surfaces of the same are transferred to the rollers *y y*, and after being scraped from the latter by the plates *z*, fall into any suitable receptacle, the leather bands *h h*, at the ends of the rollers, maintaining the surfaces of the same from contact with those of the cylinders, which are thus preserved from abrasion. The coarse fibers, detached by the plate *z*, as well as those remaining in the tanks Y Y′, are placed in the hopper V, from which they are fed into the tank L′ by the fluted roller U, the sliding plate *n* being adjusted to regulate the passage of the fibers in such quantities as may be desired. These fibers are discharged from the tank L′ into the tank L^2, and after passing between the millstones are sorted in the tanks Y, Y′, and Y^2, as before. If fibers are required which are not so finely divided as those which pass into the tank Y^2, they may be removed at any stage of the process, and it will be apparent that any desired number of tanks and cylinders may be employed in order to obtain a greater assortment of fibers.

Instead of arranging the cylinders as described they may be placed with their shafts inclined, and the material may be introduced into the interiors of the cylinders, the finer particles passing through the latter into the tanks, while the coarser fibers are rolled toward the lower end and discharge into any suitable receptacle.

A perforated pipe communicating with a water-reservoir may be arranged adjacent to each of the cylinders and sieves, so as to throw a constant stream of water onto the same and thus maintain the meshes unobstructed.

Although I have shown and described a pair of horizontal millstones as being employed for dividing the fibers, the stones may be arranged vertically or in any other suitable position. They may also be conical, fitting one within the other, or of any other desired shape.

In place of the paddle-wheel *r*, for directing the mash from the tank L^2 into the chute *s*, cords may be wound spirally round the cylinder R′, so that as the latter revolves the material is caused to flow toward one side of the tank.

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

1. The use of millstones N N′, constructed and operating substantially as described, for reducing particles of wood to paper-pulp.

2. The combination of the rake H, projection I, sieve J, and pipes K and K′ with the box B and stone D′, the whole being arranged and operating substantially as and for the purpose set forth.

3. The spring-pawl *b* and ratchet-wheel *a* constructed and operating in combination with the shaft F and pulley 9, substantially as and for the purpose specified.

4. An elastic cushion or spring, *d*, in combination with the cross-head 15 and rod 11, for the purpose set forth.

5. The block *e*, formed substantially as described, in combination with the stone D′ and boxes G G′, the whole being arranged and operating substantially as and for the purpose set forth.

6. The boxes or cross-pieces G G′, constructed with parallel sides, for the purpose specified.

7. The tanks L, L′, and L^2, with their gauze cylinders R and R′, and paddle-wheels W W′, the whole being constructed and arranged for joint operation, substantially as and for the purpose set forth.

8. The vibrating basket P, arranged and operating in the tank L, for the purpose described.

9. The rotating comb *k* and the scraping-plate *m*, in combination with the cylinder R, the whole being constructed and operating substantially as and for the purpose specified.

10. The hopper V, with its sliding door *n*,

and rotating fluted cylinder U, arranged in respect to the tank L^2 substantially as and for the purpose described.

11. The tanks Y, Y′, and Y^2, with their gauze cylinders R^2 and R^3, paddle-wheels W^2 W^3, sieve *v*, rollers *y*, and plates *z*, the whole being constructed and operating substantially as and for the purpose set forth.

12. The bands *h h*, of leather or other suitable material, secured to the rollers *y y*, for the purpose specified.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

HEINR. VOELTER.

Witnesses:

L. EBERT,

C. MARRIEL.