

J. P. HERRON.

Apparatus for Disintegrating Fibrous Substances
for Paper Pulp.

No. 151,127.

Patented May 19, 1874.

Fig. 1.

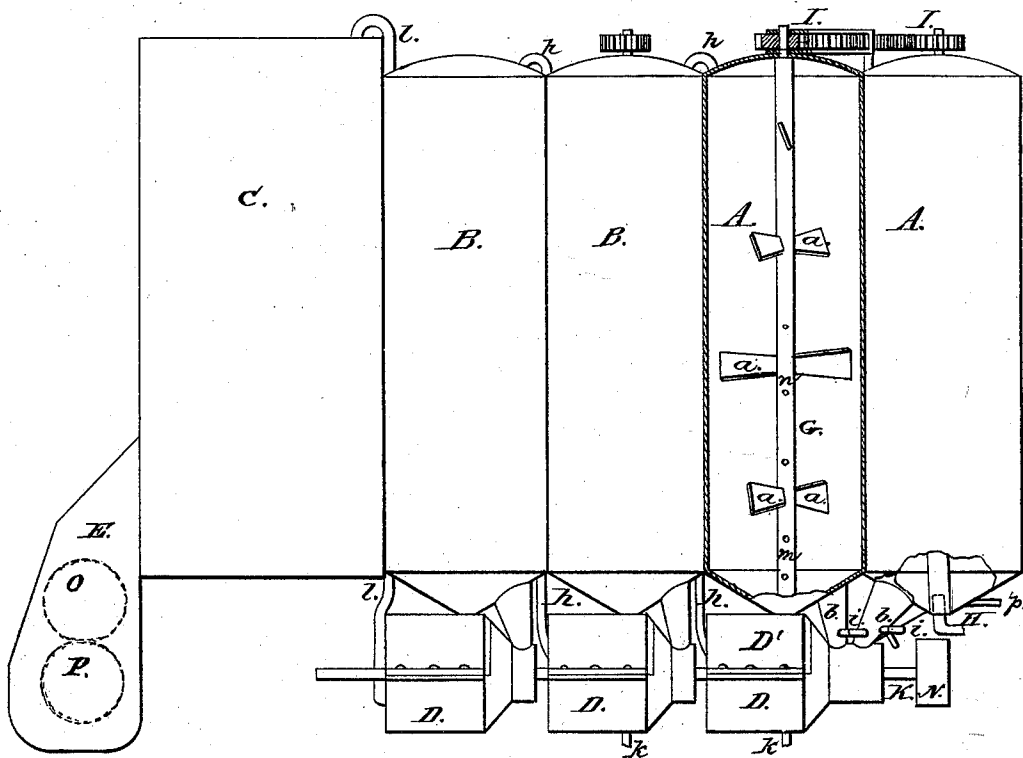
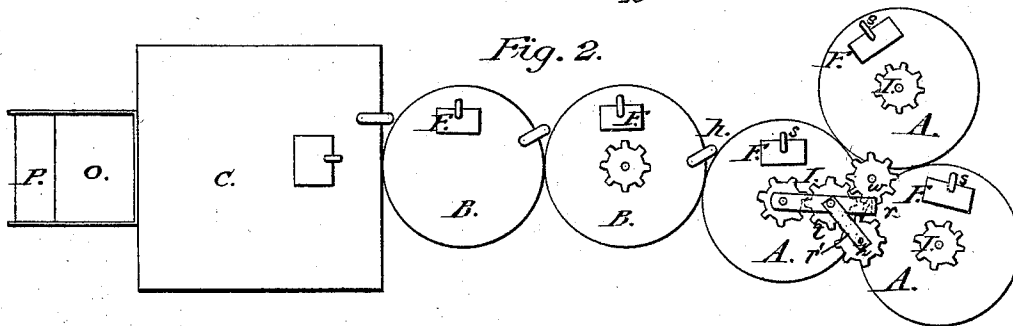


Fig. 2.



Witnesses:
J. C. Bonneau.
H. H. Burton

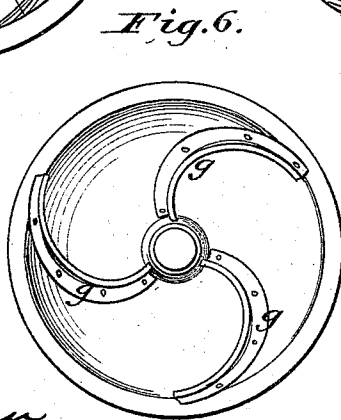
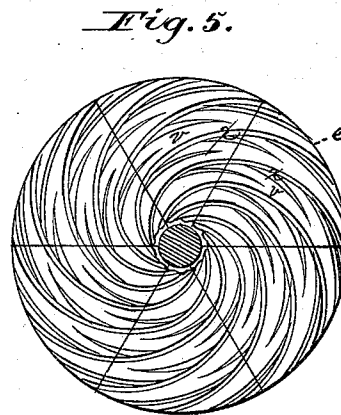
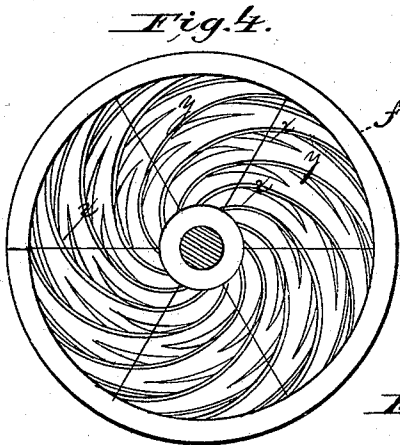
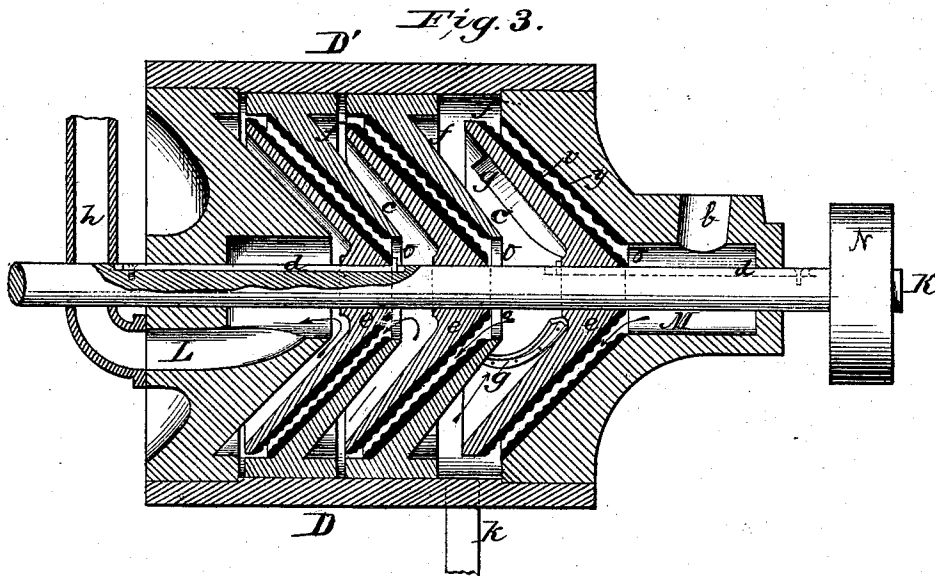
Inventor:
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Witnesses.

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UNITED STATES PATENT OFFICE.

JAMES P. HERRON, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN APPARATUS FOR DISINTEGRATING FIBROUS SUBSTANCES FOR PAPER-PULP.

Specification forming part of Letters Patent No. **151,127**, dated May 19, 1874; application filed March 26, 1874.

To all whom it may concern:

Be it known that I, JAMES P. HERRON, of the city of Washington, District of Columbia, have invented certain new and useful Improvements in Apparatus for Disintegrating Fibrous Substances for Paper-Pulp; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

The object of this invention is to produce paper-stock, ready for use, from any suitable fibrous material at a single continuous operation, in which the material for pulp is first macerated in suitable digesting-vessels, then reduced to a certain degree of fineness by passing through a grinding-engine, from which it is forced into one of a second series of digesting-vessels and again macerated, after which it passes to a second grinding-engine, and the operation is repeated until a pulp of the required consistency is produced, when it passes into a washing and cleansing apparatus, or bleaching-engine, as may be desirable for the paper or other article to be made therefrom; also, the safe and complete destruction of national-currency notes, bonds, &c., preserving the fiber in pulpy sheets, washed from all ink and original colorings; and the invention consists in the construction and arrangement of parts for accomplishing the above-named results, as will be hereafter set forth.

In the accompanying drawings similar letters of reference indicate corresponding parts in the different figures.

Figure 1 is a side view of the apparatus, showing the relative vertical positions of the different parts, and, by means of a partial section, the interior of one of the digesting-boilers, with its agitator. Fig. 2 presents a plan of the apparatus, giving position of the various devices upon a horizontal plane, and showing the means of operating the agitators. Fig. 3 is a vertical section of one of the grinding-engines, showing the relative position of the stationary and revolving grinding-disks, and the apertures for the entrance and egress of the pulp. Fig. 4 represents one of the stationary concaves of the grinding-engines.

Fig. 5 shows the convex side of one of the rotating corrugated disks; and Fig. 6 is the concave side of the same disk, showing the contour of the spiral curved or coved flanges which carry the pulp from their periphery to the center of the engine.

A A A are three vertically-placed cylindrical digesters, formed of sufficient strength to withstand the strain caused by the admission of steam at a high temperature, each one being provided in its upper part with openings, F, which are closed by suitably-hinged lids, opening inward. These openings are used for the purpose of filling the cylinders with the fibrous material from which the paper-stock is to be made. In the center of each cylinder is placed the hollow perforated vertical shaft G, the lower end of which runs on a step formed at the bottom by passing or continuing the steam-pipe H through the center, extending up and within the shaft G sufficient to pass the steam within the same, forming a fixed substantial bearing for the shaft, the upper end of which is attached to a short shaft or axle, passing within through the middle of the top end of the digester from a cog-wheel, I, on the outside, to which is geared, by frame *r*, wheels *t* and *z*. In one position the wheel *t*, gearing into the driving-wheel *w*, gives a direct motion to the agitator. By revolving the frame *r* around wheel I until wheel *z* gears into the driving-wheel *w*, a reverse motion is communicated to the agitator G, which revolving one way, the arms *a a* give an elevating or rising agitation. Revolving the same the opposite direction gives a depressing downward force. Steam and other fluids forced into the shaft G from pipe H pass out through the orifices *m* and *n* into the agitated mass, which is continually kept in motion by the arms *a a*, that are attached to the shaft G with about thirty to sixty degrees inclination, for the purpose, as before described, of elevating and agitating the massy contents of the digester while steeping; and also, by reversing their motion, to bear down and force out through the valve *i* in the pipe *b* into the chamber M of the first of a series of grinding-engines, D. These engines are formed with a suitable, strong, outside bicafe, containing the grinding apparatus. The lower portion of this case, D,

forms a stationary bed, while the upper portion D' is removable for the purpose of giving access to the interior, so that the grinding disks and plates may be properly arranged with relation to each other. A horizontal shaft, K, is provided with a driving-pulley, N, which receives its motion, through a driving-belt, from any suitable motor. The shaft then passes into the interior of the engine, through the chamber M, and carries the adjustable conical disks *e e*, which are adjusted longitudinally upon the shaft K by means of the splines *d d* moving in suitable grooves in the shaft, and held in position by set-screws or other suitable means, and to the inner ends of which they are secured. The central grinding-disk *e* is secured to the shaft permanently, and is adjusted with relation to the grinding-disk case-plate *f f*, when necessary, by moving the shaft longitudinally. A series of adjustable conical and corrugated grinding-plates, *f*, having a central opening, *o*, for the passage of the pulp from one compartment to another, and a broad flange at their peripheries by which they are secured and held firmly in position, are suitably adjusted to each other within the case D D'. These corrugated surfaces of the face-plates *y* and *v* on the dies and disk-cases are formed of cast-iron, chilled steel, or other material having sufficient strength and durability, and their arrangement upon the disk-case *f* and disk *e*, secured by bolts or other suitable means, is shown fully in Figs. 4 and 5, exhibiting the corrugated furrows with diminishing branches *x x*.

Fig. 6 shows the reverse or concave side of one of these disks, with the curved cavetto-appearing wings or arms *g g g*, as part of the disk *e*, filling out the space C between the same and disk-case *f*, which, when in motion, will carry the pulpy mass from the periphery by a centripetal action, forcing inward and forward through the orifice *o*, whence it passes the disk-case *f* to the next pair of grinding-surfaces; or, having passed through the last pair of the engine, is forced through the orifice L and pipe *h*, which passes up to the top of a following digesting-cylinder, B, into which it is discharged, for further digestion and maceration, cylinder B being constructed as one of the cylinders A, already described. A pipe, *k*, enters the engine near the first pair of grinding-disks, through which steam, for the purpose of assisting in the process of reducing the pulp and coloring matter, passing through with the material; or a bleaching preparation may be injected, if desirable, through the same opening. The cylinders B may be two or more in number, each having its corresponding grinding-engine; but the number used will depend, in a great measure, upon the quantity of the stock it is desired to produce and the purpose to which it is to be applied. From the last of the series of grinding-engines the pulp passes, through the pipe *l*, into the washing and draining tank C, and from this may pass through

the rolls O and P of the frame E, in order to form a common paper-stock; or it may pass directly from the grinding-engine to a bleaching apparatus, for further manipulation.

The method of operating my devices in the production of paper-stock from the raw material is as follows: The fibrous material, properly prepared, is placed in the digesting-cylinder A, through the opening in the top. When full, it is thoroughly saturated with water slightly impregnated with caustic alkali or its equivalent. The openings are then closed so as to be steam-tight. The steam-pipe connecting with the hollow shaft of the agitator is then opened and the steam allowed to pass into the cylinder. The agitators are also made to revolve and keep the mass continually in motion during the process of maceration. By using two or more of these cylinders in connection with a single series of grinding-engines and their accompanying digesting-cylinders *b*, I am enabled to make the process continuous. When the contents of one of the cylinders A have passed into the engine its connection therewith is closed and a communication made between the engine and another cylinder, the empty cylinder being immediately opened and refilled and prepared for digesting, thus keeping the engine constantly grinding by using the cylinders A alternately in succession. As the pulp enters the engine it is received between the conical grinding-surfaces, near their centers, but the grooves in the corrugated plates, together with the centrifugal action of the moving plates, tend to throw it from the center, and beyond the outer edge of the revolving disks, where it is caught up by the converging curved arm-like flanges upon the concave sides of the disks, and carried back to the center and forced through between other grinding or rubbing surfaces, as before, and the operation is again repeated through another pair, after which the pulp passes from the engine into a macerating-digester, B, where it is treated substantially in the same manner as in the first series, or may be varied to suit the process. From this last-named cylinder the pulp passes into a second grinding-engine, and from that into another digester, and thence into a third engine, more or less, as sufficient, from which last engine it is forced into a washing and cleansing apparatus, or carried on to such other process as may be desired.

As no macerating machinery has yet been found safe and practicable for the destruction of national-currency notes, bonds, &c., and preserve the fiber of the same, I propose one or more of the digesters A, into which such papers may be deposited by such parties having the charge of the destruction thereof, who may close the door F, locking and sealing the same, after which liquids, dissolving-fluids, chemicals, and steam may be introduced through the pipes H and *p*, with agitation sufficient to macerate the contents, then pass it directly through the grinding-engine D, which will thoroughly separate all fibers, destroying all

appearances and character of papers deposited, the engine forcing the pulpy mass into the closed washing and cleansing tank C, where all noxious filth, dirt, and coloring material is separated from the fiber, which, being thoroughly washed, is first seen in sheets of pulp passing from the rolls O and P.

Thus the destruction is as safe as, and more complete than, by fire, with no harmful emanations, at the same time saving the valuable pulp.

I do not confine myself to the arrangement of fastening the door F, as shown. Any suitable lock, seal, or device desired that will effectually fasten the door may be used.

It will be understood that the number of digesting-vessels and grinding-engines is to be proportioned in all cases to the work, both the quality and the amount required having an influence upon the matter.

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

1. The vertical steam-digester herein described, with a top opening and door, F, with lock-seal *s*, for the safe inclosing of pulp-producing material, condemned currency, and paper-making stock, concealing the same, steam-tight, and also, at the lower end, having a short discharge-pipe, *b*, with valve *i*, a steam-pipe, H, fluid-pipe *p*, and inside provided with a revolving, steam-conducting, armed elevating and depressing agitator, *m n a G*, as shown and set forth.

2. The shifting reversible cog-gearing consisting of the swinging bars *r r'*, connecting the cog-wheels *t* and *z*, through which motion is received from the driving cog-wheel *w*, and communicated to the cog-wheel I, in one way to turn the agitator G to elevate, and in a reverse way to depress, the substance contained in the digester A, substantially as described.

3. The bicase grinding-engine D D', with receptacle M and discharge L, containing a conic disk-case, *f*, having furrowed plates *y* and conical disks *e*, with outer diverging grooved plates *v* and inside converging centripetal arm-flanges *g*, connected on a revolving shaft, K, with splines *d*, and outside driving-pulley N, substantially as described.

4. Two or more digesters, A, with short dis-

charge-pipes *b*, connected with the receptacle M of a grinding-engine, D D', as shown, for the purpose described.

5. The grinding-engine constructed as described, having the spiral curved arm-like flanges on the concave side of the disk *e*, for drawing the pulp toward the center and forcing it through the orifice *o*, as described.

6. The grinding-engine D D', provided with a steam-pipe, *k*, for the purpose of steaming the substance while grinding, substantially as set forth.

7. The grinding-engine D D', provided with the discharge L and the conveying-pipe *h*, in combination with the succeeding macerating-cylinder B, for the purpose described.

8. The macerating-cylinder B, connected by a short discharge-pipe, *b*, to the receptacle M of a succeeding grinding-engine, D D', as shown.

9. The grinding-engine D D', with the discharge L, connected, by pipe *l*, to the upper or lower part of a receiving and washing vat, C, provided with fresh water for condensing the steam and washing the pulp discharged into the same, as described.

10. The washing-vat C, provided with rolls O and P, for the purpose substantially as described.

11. The digesters A A A, having the agitator G, pipes H, *p*, and dischargers *b*, with valves *i*, in combination with grinding-engines D D', pipes *h*, the macerators B, and washing-vat C, provided with rolls O and P, all combined and operating so that paper-stock may be produced by one single and continuous passing operation, as set forth.

12. The macerating-digester A, having the door F, agitator G, the grinding-engine D, and washing-vat C, provided with rolls O and P, all combined and operating as described, for the safe deposit and perfect destruction of condemned currency, and preserving the fiber thereof, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand.

JAMES P. HERRON.

Witnesses:

T. C. CONNOLLY,
H. H. BURTON.