

J. D. TOMPKINS.
 PROCESS OF PULPING AND CLEANING PAPER STOCK.
 APPLICATION FILED AUG. 29, 1906. RENEWED JULY 29, 1908.

910,881.

Patented Jan. 26, 1909.

2 SHEETS—SHEET 1.

FIG. 1.

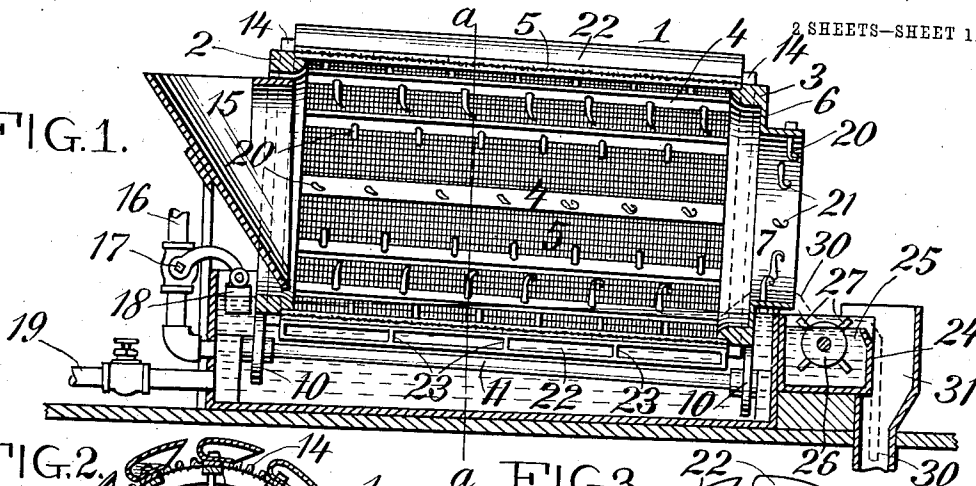


FIG. 2.

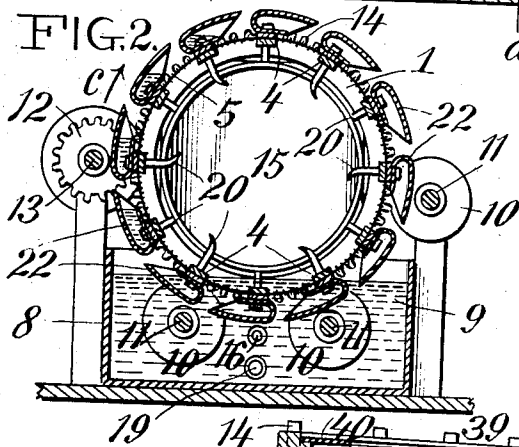


FIG. 3.

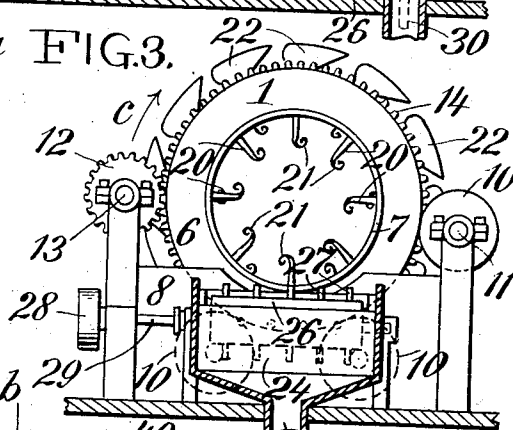


FIG. 4.

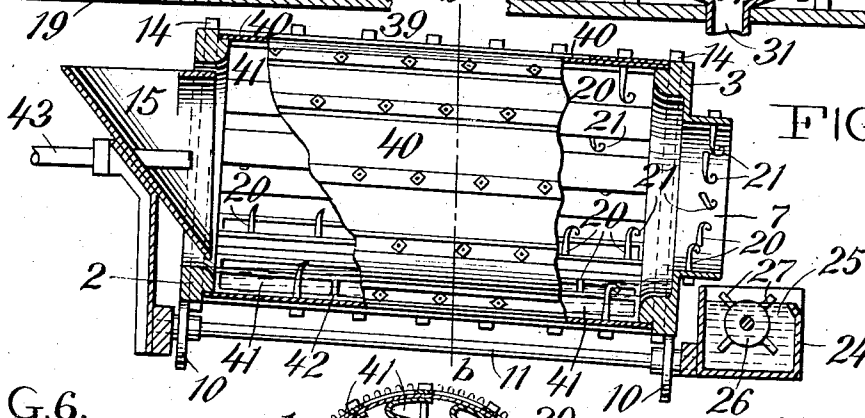
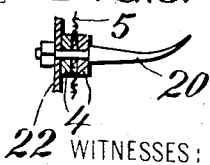


FIG. 6.



WITNESSES:

Wm. Twitchell
Alex. Scott

FIG. 5.

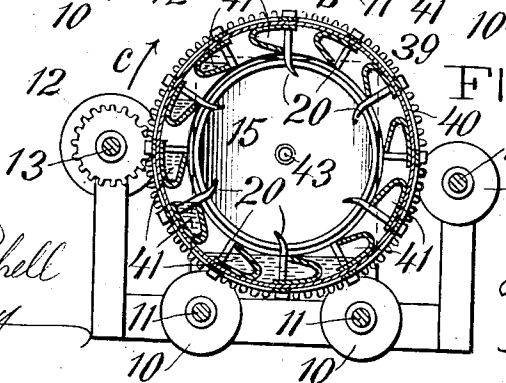
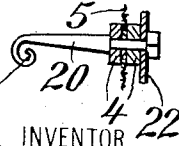


FIG. 7.



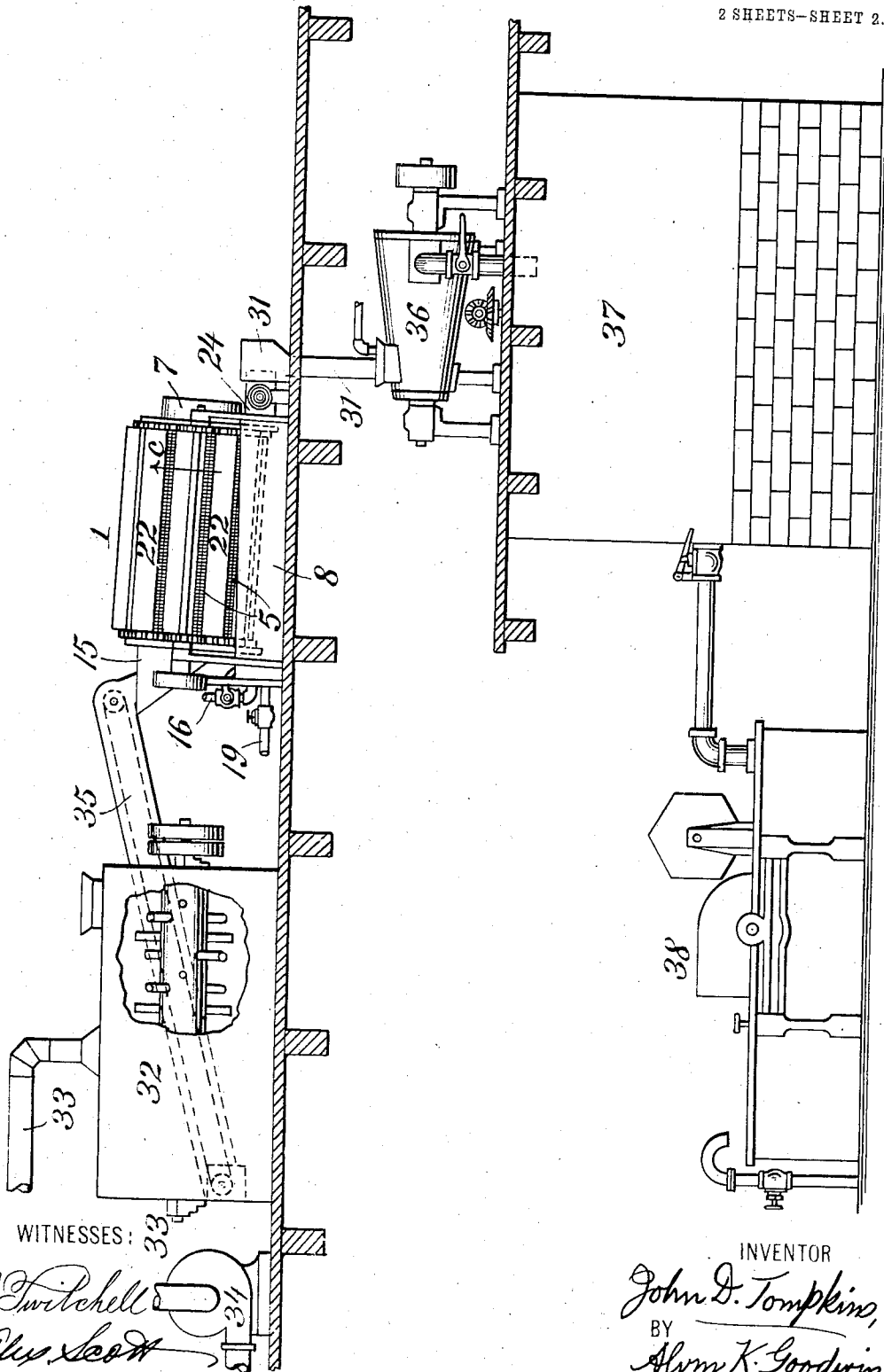
INVENTOR

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2 SHEETS-SHEET 2.



UNITED STATES PATENT OFFICE.

JOHN D. TOMPKINS, OF VALATIE, NEW YORK.

PROCESS OF PULPING AND CLEANING PAPER-STOCK.

No. 910,881.

Specification of Letters Patent.

Patented Jan. 26, 1909.

Application filed August 29, 1906, Serial No. 332,472. Renewed July 29, 1908. Serial No. 445,927.

To all whom it may concern:

Be it known that I, JOHN D. TOMPKINS, a citizen of the United States of America, residing at Valatie, Columbia county, State of New York, have invented a new and Improved Process of Pulping and Cleaning Paper-Stock, of which the following is a specification.

This invention relates to a novel process of pulping and cleaning paper stock, old paper stock more particularly, and the object of the invention in its more complete realization is to automatically and economically provide for dusting, soaking and rough-pulping paper stock and separating strings and nails and bits of metal or other heavy foreign substances from the stock without violent or destructive mechanical attrition during preliminary separation of the fibers thus preserving their strength, and while the stock has continuous and uninterrupted onward flow or movement, and then digesting or otherwise disintegrating the stock to put it in the best possible condition for making from it at small expense new paper or paper board of high quality.

The accompanying drawings forming part of this specification, illustrate preferred forms of apparatus to be hereinafter described in elucidation of the improved process, and the novel features of the invention will be particularly pointed out in the appended claims.

In the drawings Figure 1 is a central longitudinal vertical section of a preferred apparatus by using which the main soaking or rough-pulping and cleaning steps or features of the improved process may be practiced. Fig. 2 is a vertical cross-sectional view of this apparatus, taken on the line *a-a* in Fig. 1. Fig. 3 is an end elevation as seen from the discharge end of the paper stock cylinder. Fig. 4 is a longitudinal partly broken out vertical sectional view of such an apparatus in modified form. Fig. 5 is a vertical cross-sectional view, taken on the line *b-b* in Fig. 4. Fig. 6 is an enlarged detail view showing one of the plain curved stock agitating teeth of the paper stock cylinder. Fig. 7 is a detail view showing one of the end-hooked stock agitating and string catching and retaining teeth of said cylinder; and Fig. 8 is a somewhat diagrammatic elevation of a paper stock plant the opera-

tion of which involves all steps or stages of the complete process herein described and claimed.

Although this invention in one or more of its steps or stages may be practiced by using various forms of apparatus, a preferred paper stock pulping and cleaning apparatus is shown in Figs. 1, 2 and 3 of the drawings, in which the numeral 1, indicates an open-ended stock receiving cylinder made with front and rear end rings 2, 3, connected preferably by longitudinal two-part metal bars 4; and a pervious cylinder wall 5, preferably made of wire netting fixed to the bars 4, and preferably between their inner and outer parts. The rear ring 3 preferably has an annular flange formed with a radial portion which sufficiently retards discharge of the rough-pulped and partially cleaned paper stock from or over the longitudinal spout portion 7 of the ring flange.

The stock cylinder may be sustained in any approved manner and for revolution over a tank 8 into which hot or cold water or other pulp treating fluid 9 rises to proper level to assure rotation of the lower side or part of the cylinder in and through the fluid. The cylinder is shown supported at its end rings upon anti-friction rollers 10 fixed to shafts 11, and the cylinder is rotated preferably by two pinions 12 fixed to a shaft and engaging gear teeth 14 formed on or fixed to the end rings 2, 3. Any suitable chute or hopper 15 conducts the paper stock into the cylinder. Fluid may be supplied to the tank 8 in any approved manner, and preferably through a pipe 16 having a valve 17 to which may be connected a float 18 which rests upon or in the fluid 9 in the tank 8 and automatically maintains the desired fluid level therein. A valved pipe supplies steam to the fluid to maintain it at any desired temperature.

The cylinder bars 4 preferably carry series of inwardly projecting teeth or spikes which alternately lift and drop the paper stock and thus thoroughly agitate it within the cylinder. A number or series of these teeth, preferably those at and toward the discharge end of the cylinder, have hook-shaped ends which catch and retain ordinarily invisible strings or like fibrous foreign substances in the soaked and partially reduced paper stock. Practically complete

removal of strings is of the greatest importance in re-preparing old paper stock, as such strings by accumulating seriously clog and often break stock refining machinery and also promote lumpy formations the reduction of which directly tends to violent disruption and pulverization and "killing" of the other stock fibers. It is preferred to have the series of string catching teeth 20—21, extend from the discharge end of the cylinder forward for about one-half an arm's length so that the operator by reaching inward and forward with one hand may grasp the collected strings and remove them from the hooked teeth to maintain maximum working efficiency of the cylinder. These stock agitating and string catching teeth are preferably arranged helically or in staggered relation around the cylinder. In this preferred construction of the paper stock cylinder a series of fluid buckets 22 are arranged outside of the cylinder wall 5, and are held to the cylinder bars 4, and extend the full length of the cylinder. The inner walls of these buckets are shown lying about flush with the front faces or edges of the bars but the outer edges of the buckets project considerably farther to form prolonged fluid detaining lips, as more clearly shown in Fig. 2 of the drawings. Each bucket preferably has a series of transverse partitions 23 which assure equable and copious supply of fluid for the entire length of the buckets notwithstanding the normal downward incline of the cylinder, and the partitions incidentally increase the stiffness and durability of the buckets. During rotation of the cylinder these buckets 22, in the preferred method of operation, automatically take portions of the fluid 9 from the tank 8 and repeatedly discharge them inward through the pervious cylinder wall 5, for continuously soaking the agitated paper stock within the cylinder, as hereinafter more fully explained.

At the discharge end of the cylinder 1, there is preferably placed a transverse sink or trap 24 into which fluid 25 may flow from the cylinder 1 with the treated paper stock as the latter is discharged from the cylinder into the sink. Within the sink 24 is journaled a transversely ranging roller 26, preferably armed with radial teeth 27 and rotated by a pulley 28 on the roller shaft 29. The periphery of the roller agitates and laterally spreads and forwardly impels the soaked and rough-pulped stock 30 discharged from the cylinder 1 and passing over the sink fluid 25 and the outer wall of the sink into a hopper 31 which conducts the pulp preferably to a paper stock digester hereinafter mentioned. The fluid-charged sink 24—25 and its roller 26, also aid the gravital discharge from the stock of nails or like heavy foreign substances as the soaked and partially reduced stock moves forward

from the cylinder 1 for discharge into and from the upper part of the sink 24, and these operations are further facilitated by the action of the roller teeth 27 which also perform the further important function of combing from the discharging stock strings not previously caught by the hooked teeth 20—21 of the rotating cylinder.

Before particularly explaining the operation of this preferred paper stock pulper and cleaner shown in Figs. 1, 2 and 3 of the drawings, the general relative arrangement of various apparatus constituting a preferred complete plant for cleaning and soaking and repulping old paper stock, and shown in Fig. 8 of the drawings, will be briefly described as follows:—

The numeral 32 indicates a duster of any approved construction, which reduces the dry paper stock to a substantially uniform fragmentary size while removing dust and dirt through pipe 33 and exhaustor 34. The duster also removes much other foreign substances in usual manner and finally discharges the partially reduced and cleaned dry stock to a conveyer 35 giving chance for hand-removal of all observable strings and other foreign substances. The conveyer 35 discharges the dusted and hand-cleaned dry stock into the hopper 15 of the cylinder 1 into which the stock falls for special treatment hereinafter explained. From this cylinder 1, the fluid-soaked and rough-pulped paper stock passes into the sink 24, from which the stock preferably passes into a hopper 31 which discharges the pulp into a digester 36 for further separation of the stock fibers. From this digester the treated stock passes preferably into a stuff-chest 37, but if desired the stock may be piped directly from the sink 24 into the chest 37. If it is desired to make the finer grades of paper or paper board, the stock is fed from the chest 37 to a washing engine 38 for further cleaning or refinement. If it is desired to make common wrapping paper or paper boards, the pulp may be conducted directly from this stuff-chest to a paper machine or to a Jordan refining engine.

The continuous operation of the preferred soaker, pulper and cleaner shown in Figs. 1, 2 and 3 of the drawings will now be explained. As the old paper stock, preferably after being operated upon by an ordinary duster, such as the one 32, is fed from the conveyer 31 into the chute 15, the stock enters the cylinder 1, now rotating in direction of the arrow *c*, and falls into the fluid 9 at the bottom of the cylinder 8, and is caught by the cylinder bars 4 and teeth 20 which carry it upward and partly around the cylinder until it reaches a point where gravity causes it to drop from the teeth back into the fluid. The helical arrangement of the cylinder teeth, together with the downward incline

of the cylinder, gradually moves the stock forward for discharge into the sink 24. The fluid 9 in the tank at the bottom of the rotating cylinder acts as a cushion receiving the stock falling from the bars 4 and teeth 20 and upper portions of the peripheral wall 5 of the cylinder. During soaking of the stock in the fluid at the bottom of the rotating cylinder and during lifting and agitation of the stock by the cylinder teeth 20 and their supporting bars 4, the rotating buckets 22 fill automatically while passing through the fluid 9 in the tank 8.

It will be specially noticed that immediately the buckets rise from the fluid in the tank the forwardly prolonged bucket lips, by temporarily retaining or damming the fluid, assure prompt discharge of the bucket contents inwardly through the pervious cylinder wall 5 both uniformly and copiously for the entire length of the cylinder. This prompt inward fluid discharge from the buckets first meets and repels any outflowing forward swash of fluid caused by rotation in and through the fluid cushion of the cylinder bars and teeth and the stock adhering thereto, and said bucket discharge, by passing inwardly through the stock within the cylinder, assures the continuous and thorough sprinkling and soaking of all the stock and especially that which is lifted by and is clinging to and falling from the cylinder teeth 20 and their supporting bars 4, while the bucket discharge also loosens the raised stock fibers lodged on the cylinder teeth and bars and peripheral wall and thus facilitates gravital fall of the stock fibers therefrom into the fluid cushion at the bottom of the cylinder. It will also be specially noticed that paper stock fibers which may be temporarily washed outward through the pervious cylinder wall 5 about at the water level in the tank 8 by the forward swash of the paper stock, will be caught by the long-lipped bucket 22 just rising from said fluid level, and the prompt inward discharge from said rising bucket will return said outwashed fibers through the pervious wall 5 into the cylinder. It will also be seen that any paper stock fibers which may possibly be washed outward through this wall by direct flow of fluid from any one of the rising buckets 22 will be caught by the following bucket and will be washed back again into the cylinder through its pervious wall 5 by the inward discharge from said following rising bucket. The above named recovery or return within the stock cylinder by inflow thereto with the bucket discharges of fine stock fibers which may temporarily be outwashed through the pervious cylinder wall by the stock swash at or near the fluid level in the tank, or by fluid discharge from the rising buckets, or which may escape through the wall by gravital fall from upper portions of said wall, assures that escape of

stock fibers from the rotating cylinder into the fluid 9 in the tank 8, is avoided and fiber waste is therefore practically prevented. As the stock under treatment in the cylinder reaches the zone of rotation of the hooked cylinder teeth 20-21, the hooks 21, by their cross-passage through the stock, catch the heretofore unremoved strings and retain them or the larger part of them. When the hooks sufficiently fill with such strings or substances, the rotation of the cylinder may or may not be stopped at discretion of the operator who will insert his hand at the discharge opening of the cylinder to quickly remove the accumulated strings.

It is obvious that the soaking of the paper stock within the cylinder in the tank fluid and the practically continuous inward fluid discharge from the cylinder buckets for sprinkling, soaking and softening the stock in the cylinder, together with the agitation of the stock by the cylinder bars and teeth, and the falling of the soaked stock from the cylinder bars and teeth and wall into the tank fluid, assures very quick, thorough and continuous preliminary softening and separation of the paper stock fibers without violent disintegration of them and therefore without shortening the length or impairing the strength of the fibers, and also without wasting the stock, and the stock while wet is put in the best possible condition for further automatic removal from it of strings, or of nails or other heavy foreign substances.

As the soaked and rough-pulped stock flows from the cylinder 1 into the upper part of the sink 24, nails or bits of metal gravitally fall from the stock into the sink while the on-flowing stock is helped forward and is spread laterally, and the gravital separation of nails also is facilitated, by the moving periphery of the roller 26, aided materially by the roller teeth 27, as the toothed roller is rotated at a speed considerably faster than that of the paper stock cylinder 1. The roller teeth 27 also catch and remove and comb out from the discharging stock strings which may have possibly escaped removal by the hooked cylinder teeth 20-21. All strings which may escape between or from the hooked cylinder teeth 20-21, will, by the cross-travel of said teeth through the stock mass, be laid transversely within the cylinder, and this makes it all the more certain that these remaining strings will be removed or combed out of the stock by being caught and retained by the roller teeth 27 which operate in the line of travel of the discharging stock as the toothed roller 36 impels the stock forward from the sink 24, and preferably to the hopper 31 conducting the soaked, rough-pulped and fully cleaned stock to subsequently used pulp refining or preparing apparatus, such as the digester 36 and stuff-chest 37, shown in Fig. 8 of the drawings. Strings collecting on the

roller teeth 27 will be removed by hand, and the sink 24 will be cleared of nails or bits of metal at intervals, when the toothed roller is at rest.

The removal of unobserved strings and bits of metal or other foreign substances from the wet stock by the hereindescribed apparatus is rapid, thorough and continuous, and when to this important feature is added the automatic and thorough soaking, agitation and softening of the stock as the stock has continuous and uninterrupted onward flow or movement, and without shortening the length or impairing the strength of the stock fibers, it is obvious that all these operations may be advantageously performed at minimum expense by the use of this simple apparatus, and before the stock is operated upon by a reducing, washing, beating or refining engine. It will be specially noticed that no hard stringy lumps remain in the rough-pulped stock treated in this apparatus, and consequently there is little or no danger of destruction or "killing" of stock fibers by attritional pulverization which would be necessary to reduce such stringy lumps in any subsequently used pulp refining apparatus.

Economy in the use of fluid, hot or chemical fluid especially, is of prime importance in operating apparatus of this class. The functions automatically and continuously performed by this paper stock pulping and cleaning apparatus far transcend the mere washing of paper pulp producing material, and include a preliminary soaking of the paper stock for softening and gently separating its fibers, rough-pulping the stock, and freeing it from unobserved strings and nails and other foreign substances, and all without shortening or weakening the stock fibers, and prior to subjecting the stock to further refining influence. These aforesaid functions are each and all greatly facilitated by employing in this one simple apparatus shown in Figs. 1, 2, and 3 of the drawings, hot or tepid water or fluid, which because of its repeated use by the inwardly discharging buckets 22, assures performance of all functions with a minimum water supply.

This apparatus, especially that shown in Figs. 1, 2 and 3 of the drawings, may be advantageously used for treating old newspapers or other printed or colored paper stock which, after being preferably acted upon by an ordinary duster, is fed into the cylinder 1 while it is rotating in a hot or warm acid solution 9 supplied to the tank 8. Any such old printed or colored paper stock is thoroughly soaked and the ink or color therein is effectually saturated and softened and dissolved and blended so that the fully reduced stock or pulp will have a uniform tint controlled by the preponderance of any particular color in the original old paper stock. It will be specially noticed that the

stock fiber itself is softened and gently separated without injuring it, and all by a single passage of the stock through the cylinder 1, during which the stock is agitated and is kept thoroughly soaked within the cylinder by the desired fluid or solution, and strings and nails and bits of metal are practically all removed.

By varying the speed of rotation of the paper stock cylinder, different classes of paper stock may be caused to travel through the cylinder at varying speeds, as may be required to subject them to treatment for a longer or shorter time, and whereby all classes of stock may be reduced to a rough pulp having a uniform consistency.

In the modified apparatus sufficiently shown in Figs. 4 and 5 of the drawings, the open-ended paper stock cylinder 39 has an impervious or solid peripheral wall 40, and the means carried by the cylinder for continuously and directly and unobstructedly discharging water or fluid upon the continuously advancing stock within the cylinder are buckets 41 arranged within the cylinder and preferably having transverse partitions 42, like the above named buckets 22. The buckets 41 may be fastened in any approved manner to the solid cylinder wall 40. Water or fluid may be supplied by a pipe 43 discharging into the cylinder with the stock fed thereto from the chute 15, and the hereinbefore mentioned fluid tank 8 is dispensed with. The stock agitating and string catching teeth 20—21, are held to the cylinder wall 40 and may overlie the transverse partitions 42 of the buckets 41. The nail catching sink 24 and the pulp agitating and combing toothed roller 26—27, are arranged substantially as in the first described apparatus shown in Figs. 1, 2 and 3 of the drawings.

In operating this modified apparatus, the cylinder is fed at its charging open end with paper stock and water or fluid, and the buckets 41 repeatedly take up portions of the fluid confined at the bottom of the cylinder to a depth or level permitted by its open end rings, and the buckets repeatedly discharge said portions of the fluid upon the paper stock or material continuously advancing longitudinally within the cylinder until the soaked and treated stock is automatically discharged at the farther open end of the cylinder into the upper part of the sink 24, whence it may be conducted by a hopper to a digester 36, or other pulp treating apparatus. Strings and nails are removed by the cylinder teeth 20—21, the sink 24, and the toothed roller 26—27, substantially as hereinbefore described. The internal buckets 41, or equivalent internal means held to the open-ended cylinder, by repeatedly receiving fluid and discharging it upon the advancing stock being treated in the cylinder, make this modified apparatus in this respect operate sub-

stantially like the preferred apparatus having external brackets 22, as shown in Figs. 1, 2 and 3 of the drawings.

By remembering the operative functions of the above described apparatus, the variously combined steps or stages of this improved paper stock pulping and cleaning process specified in the appended claims will be clearly understood without further detailed description.

I claim as my invention:—

1. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid, and repeatedly raising portions of said fluid and discharging the same upon the advancing stock, substantially as set forth.

2. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, and repeatedly raising portions of said fluid and discharging the same upon the advancing stock, substantially as set forth.

3. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid, agitating the advancing stock mass, and repeatedly raising portions of said fluid and discharging the same upon the advancing agitated stock mass, substantially as set forth.

4. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, agitating the advancing stock mass, and repeatedly raising portions of said fluid above the fluid level and discharging the same upon the advancing agitated stock mass, substantially as set forth.

5. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, lifting portions of the stock above said fluid level and then dropping them into the fluid, and repeatedly raising portions of said fluid and discharging the same upon the advancing agitated stock mass, substantially as set forth.

6. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid, and repeatedly raising portions of said fluid and discharging the same upon and inwardly through the advancing stock, substantially as set forth.

7. The hereindescribed process of continuously rough-pulping paper stock practically without loss of fibers, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid, and repeatedly raising

portions of said fluid and discharging the same upon and inwardly through the advancing stock, and recovering by a subsequent inward fluid flow or discharge stock fibers possibly escaping under influence of a prior fluid flow or discharge, substantially as set forth.

8. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, and repeatedly raising portions of said fluid and discharging the same upon and inwardly through the advancing stock, substantially as set forth.

9. The hereindescribed process of continuously rough-pulping paper stock practically without loss of fibers, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, and repeatedly raising portions of said fluid and discharging the same inwardly through the advancing stock, and recovering by a subsequent inward fluid flow or discharge stock fibers possibly escaping under influence of a prior fluid flow or discharge, substantially as set forth.

10. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid, agitating the advancing stock mass, and repeatedly raising portions of said fluid and discharging the same inwardly through the advancing agitated stock mass, substantially as set forth.

11. The hereindescribed process of continuously rough-pulping paper stock practically without loss of fibers, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid, agitating the advancing stock mass, and repeatedly raising portions of said fluid and discharging the same upon and inwardly through the advancing agitated stock mass, and recovering by a subsequent inward fluid flow or discharge stock fibers possibly escaping under influence of a prior fluid flow or discharge, substantially as set forth.

12. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, agitating the advancing stock mass, and repeatedly raising portions of said fluid and discharging the same inwardly through the advancing agitated stock mass, substantially as set forth.

13. The hereindescribed process of continuously rough-pulping paper stock practically without loss of fibers, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, agitating the advancing stock mass, and repeatedly raising portions of said fluid and discharging the same upon

and inwardly through the advancing agitated stock mass, and recovering by a subsequent inward fluid flow or discharge stock fibers possibly escaping under influence of a prior fluid flow or discharge, substantially as set forth.

14. The hereindescribed process of continuously rough-pulping paper stock, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, lifting portions of the stock above said fluid level and then dropping them into the fluid, and repeatedly raising portions of said fluid and discharging the same upon and inwardly through the advancing agitated stock mass, substantially as set forth.

15. The hereindescribed process of continuously rough-pulping paper stock practically without loss of fibers, consisting in subjecting forwardly moving stock to the dissolving influence of a fluid maintained at approximate level, lifting portions of the stock above said fluid level and then dropping them into the fluid, and repeatedly raising portions of said fluid and discharging the same inwardly through the advancing agitated stock mass, and recovering by a subsequent inward fluid flow or discharge stock fibers possibly escaping under influence of a prior fluid flow or discharge, substantially as set forth.

16. The hereindescribed process of continuously and automatically treating paper stock for removing strings therefrom prior to treating the stock in a reducing, washing, beating or refining engine, consisting in soaking advancing paper stock, and transversely and permanently removing strings from the advancing fluid-soaked stock mass, substantially as set forth.

17. The hereindescribed process of continuously treating paper stock for automatically removing strings therefrom, consisting in soaking forwardly moving stock, laying the strings in the moving stock mass transversely or across the line of travel of the soaked stock, and then combing the stock mass in direction of its line of travel to catch the transversely laid strings, substantially as set forth.

18. The hereindescribed process of continuously treating paper stock for removing strings therefrom, consisting in soaking forwardly traveling stock, and transversely and permanently removing strings from the forwardly traveling fluid-soaked stock mass while laying remaining strings transversely or across the line of travel of the stock mass, and then combing the stock mass in direction of its line of travel to catch said transversely laid strings, substantially as set forth.

19. The hereindescribed process of continuously and automatically treating old paper stock prior to treatment of it in a re-

ducing, washing, beating or refining engine, consisting in soaking and partially disintegrating or pulping said stock, and discharging the paper stock mass, and immediately agitating and forwardly impelling said discharging partially pulped stock mass in the atmosphere, thereby facilitating gravital separation from said discharging stock of nails or other heavy foreign substances, substantially as set forth.

20. The hereindescribed process of continuously and automatically treating paper stock prior to treatment of it in a reducing, washing, beating or refining engine, consisting in soaking and partially disintegrating or pulping said stock, and advancing and discharging the paper stock mass, and then agitating and forwardly impelling said discharging partially pulped stock mass and automatically combing the same, thereby facilitating removal of strings from the discharging stock and promoting gravital separation from it of nails or other heavy foreign substances, substantially as set forth.

21. The hereindescribed process of continuously and automatically treating paper stock prior to treatment of it in a reducing, washing, beating or refining engine, consisting in soaking and partially disintegrating or pulping said stock, and advancing and discharging the paper stock mass, and transversely and permanently removing strings from the advancing partially pulped stock mass, and agitating and forwardly impelling said discharging stock mass in the atmosphere, thereby facilitating gravital separation from said discharging stock of nails or other heavy foreign substances, substantially as set forth.

22. The hereindescribed process of continuously treating paper stock, consisting in soaking and partially disintegrating or pulping said stock, and forwardly advancing the same, and transversely and permanently removing strings from the traveling partially pulped stock mass while laying remaining strings transversely or across the line of travel of said mass, then discharging the stock mass, then agitating and forwardly impelling the discharging stock mass thereby facilitating gravital separation therefrom of nails or other heavy foreign substances, and combing the discharging stock mass in direction of its line of travel to catch the strings laid transversely therein, substantially as set forth.

23. The hereindescribed process of automatically repulping old paper stock, consisting in imparting a continuous and uninterrupted forward movement to the stock, dusting said advancing stock, and soaking and partially disintegrating or rough-pulping the advancing dusted stock prior to its treatment in a reducing, washing, beating or refining engine, substantially as described.

24. The hereindescribed process of automatically repulping old paper stock, consisting in imparting a continuous and uninterrupted forward movement to the stock, dust-
5 ing said advancing stock, soaking and partially disintegrating or rough-pulping the advancing dusted stock, and removing therefrom strings and nails or other heavy foreign substances prior to its treatment in a
10 reducing, washing, beating or refining engine, substantially as described.

25. The hereindescribed process of automatically repulping old paper stock, consisting in imparting a continuous and uninterrupted forward movement to the stock, dust-
15 ing said advancing stock, soaking and partially disintegrating or rough-pulping the advancing dusted stock, and then digesting said stock prior to its treatment in a reducing,

washing, beating or refining engine, substantially as described. 20

26. The hereindescribed process of automatically repulping old paper stock, consisting in imparting a continuous and uninterrupted forward movement to the stock, dust-
25 ing said advancing stock, soaking and partially disintegrating or rough-pulping the advancing dusted stock and removing therefrom strings and nails or other heavy foreign substances, and then digesting said stock
30 prior to its treatment in a reducing, washing, beating or refining engine, substantially as described.

JOHN D. TOMPKINS.

Witnesses:

EDWIN D. HOWE,

WILLIAM A. SPRINGSTEEN.