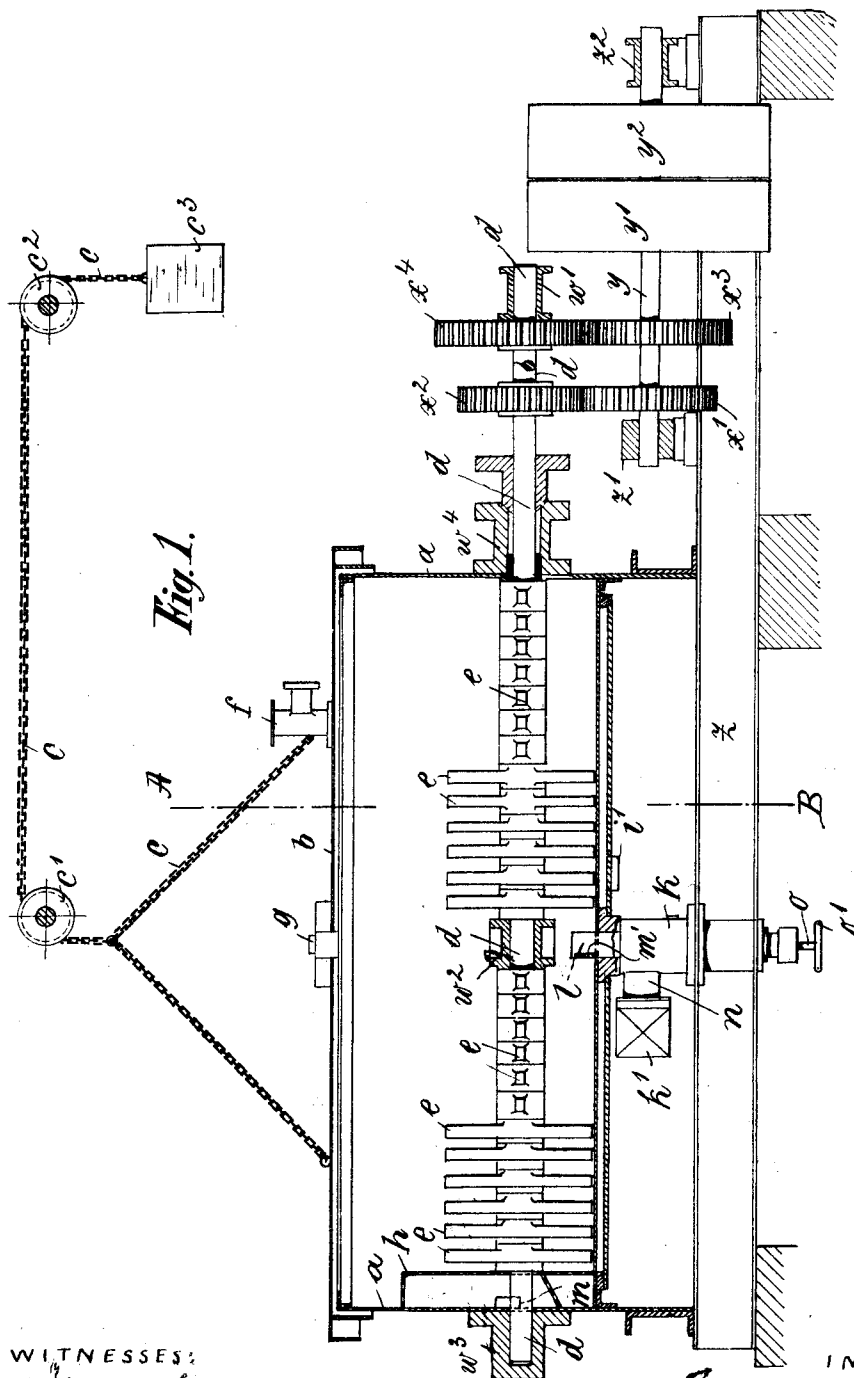


F. SAHLFELD.
 APPARATUS FOR EXTRACTING RUBBER.
 APPLICATION FILED MAY 23, 1911.

Patented Dec. 31, 1912.

3 SHEETS—SHEET 1.

1,048,892.



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Fig. 2.

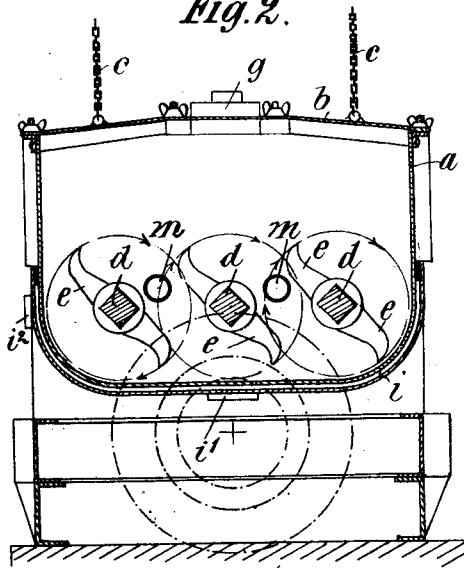


Fig. 3.

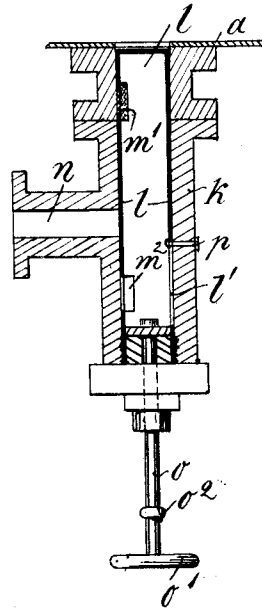
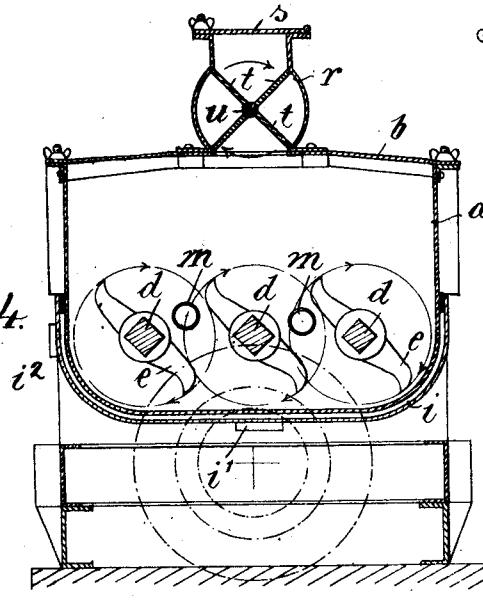


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

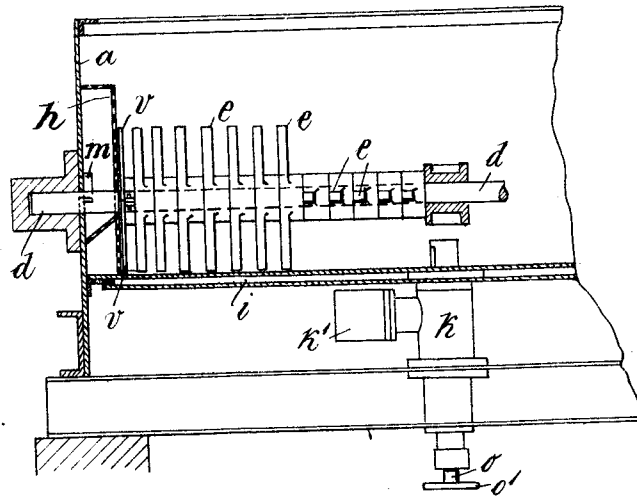
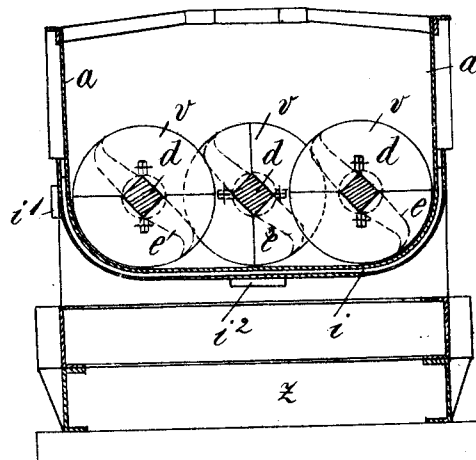


Fig. 6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR EXTRACTING RUBBER.

1,048,892.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed May 23, 1911. Serial No. 628,985.

To all whom it may concern:

Be it known that I, FRIEDRICH SAHLFELD, a citizen of the Empire of Germany, residing at Hanover, in the Empire of Germany, have invented a new and useful
5 Method of and Apparatus for Extracting Rubber, of which the following is a specification.

The crude india rubber was hitherto frequently cut into small bits, then treated with solvents, next preliminarily washed, afterward rolled into plates, and at last washed out, before the material was passed through an extracting apparatus. The rolling is
15 however, objectionable for the reason, that the material is thereby impaired, so that the danger of its decomposition is increased. Moreover the rolling and washing out required a very great driving power and a
20 good deal of labor and trouble.

My invention relates to improvements in this manufacture, whereby the rolling and washing out of the material is saved, and consequently the extraction of the rubber or
25 rubber-like substance is simplified, cheapened and facilitated.

According to my invention the crude rubber or similar raw material is together with any known solvent at once put into an extracting apparatus, that is a closed prismatic horizontal vessel, in which for example three parallel horizontal shafts with juxtaposed knives are mounted to turn, the knives being arranged to work together
35 similar to scissors for cutting up the material. In order to reduce the driving power as much as possible, the knives on the shafts are so disposed, that they can only periodically and in groups cut the material. In
40 order to assist the solvent in its action upon the material for removing the resinous matters, the closed vessel is preferably steam-jacketed, so that the material can be heated up to a temperature, which does not yet
45 produce any decomposition of the rubber. Special valves are disposed at the bottom and preferably also at the end sides of the vessel and are so constructed, that tubular
50 pistons can be pushed in, so that their inner ends project into the vessel and disclose perforations for permitting the liquid to flow off. Sieves are disposed near the bearings of the three shafts for keeping the particles of material off from the bearings. On the
55 top of the closed vessel a device may be disposed for receiving any quantity of crude

rubber or other raw material and discharging it into the vessel. Any of the known solvents can be introduced together with water into the closed vessel through valves. As after the extraction of the rubber or
60 rubber-like substance the impurities and the mechanical associates are removed with the solvent, no further washing of the extracted rubber or rubber-like substance is required.

I will now proceed to describe my invention with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through an extracting apparatus, Fig. 2 is
70 a vertical cross section through the same on the line A—B in Fig. 1, Fig. 3 is a vertical longitudinal section on an enlarged scale through one of the liquid discharging valves, Fig. 4 is similar to Fig. 2 and shows a
75 modification of the top or cover, it being provided with a special device for receiving the material and discharging it into the vessel, Fig. 5 is similar to the left part of
80 Fig. 1 and shows a modification, a protecting disk being disposed on the shaft in proximity of the sieve near the left bearing, and Fig. 6 is similar to Fig. 2 and shows on the three shafts the protecting
85 disks in Fig. 5.

Similar letters of reference refer to similar parts throughout the several views.

The extracting apparatus essentially consists of a prismatic trough *a* of any known construction, a cover *b* and three parallel
90 horizontal shafts *d d*. The trough *a* is shown to be mounted on a frame *z*, which extends to the right in Fig. 1 and carries a driving shaft *y* turning in suitable bearings *z'* and *z''*. Fast and loose pulleys *y'*
95 *y''* are disposed for supplying power to the shaft *y*, which is adapted to drive the middle shaft *d* by means of gear wheels *x'*, *x''* and the two outer shafts *d d* by means of gear wheels *x''*, *x'''*. The three shafts *d d*
100 are assumed to run all in the same direction, although this is not absolutely necessary. The shafts *d d* may be supported by bearings *w'* on the right in Fig. 1, bearings *w''* on the left at the left end side of the trough
105 *a*, a beam *w''* in the middle and stuffing-boxes *w'''* at the right end of the trough *a*. The two-armed knives *e e* juxtaposed on each shaft *d* are shown to be divided into four groups, in each of which the knives
110 have the same position on the shaft and the knives of any group are set at right angles

to the knives of the neighboring groups, so that the groups alternate with one another, as is clearly shown at Fig. 1. The circles described by the ends of the knives *e* on the three shafts *d d* cut each other, as is shown at Fig. 2, and the knives *e* on the two outer shafts *d d* are made to alternate with those on the middle shaft *d* in such a manner, that the knives on any shaft can periodically work with the knives on any neighboring shaft similar to scissors. It will be understood, that as not all of the knives are to work at a time, the driving power required for them is kept moderate. Preferably a sieve *h* is disposed near the left bearings *w*³ in Fig. 1, which passes through the trough *a* from one side to the other one and serves for keeping the cut-up material off from the bearings *w*³. Preferably a protecting disk *v* (see Fig. 5) is disposed on each shaft *d* in proximity of the sieve and serves for preventing the material from being pressed against the sieves by the knives, whereby otherwise the sieves might be blocked up. Preferably the three protecting disks *v v* are made in halves (see Fig. 6), so that they can be easily taken off for cleaning and again replaced without the necessity of removing the entire cover *b*. Where so preferred, of course a sieve similar to *h* may be disposed near the stuffing-boxes *w*⁴ in the right end side of the vessel *a* in Fig. 1 and protecting disks similar to *v v* may be disposed on the three shafts *e e* in proximity of the said additional sieve.

The cover *b* is preferably made detachable in any known manner and is suspended from chains *c c* passing over pulleys *c'* *c'*, so that the cover *b* can be balanced by means of counter-weights *c*³ and can be easily moved up and down. The cover *b* is provided with a tubular connection *f* of any known construction for the introduction of solvents and water. Also the cover *b* is provided with a tubular connection *g* for the gases and vapors escaping from the apparatus.

The cover *b* requires to be taken off for charging the trough *a* with crude rubber or other raw material, after which the cover is replaced. In cases, where this operation is undesirable, the cover *b* may be provided with a manhole (not shown) of any known construction, through which the material can be charged into the trough.

The lower part of the trough *a* is provided with a steam-jacket *i* having a steam-inlet *i'* and a steam-outlet *i*².

I provide several liquid-discharging valves of the construction shown in Fig. 3, for example one at the bottom beneath the beam *w*² and two at each end of the trough *a*, as indicated by *m m* in Fig. 2. Each liquid-discharging valve consists of a cylindrical casing *k* adapted to be fastened on

the trough *a* and provided with a tubular connection *n*, which can be connected by means of a suitable stop valve *k'* with a pipe for conducting the liquid away. A tubular piston *l* is mounted in the casing *k* to move longitudinally, while it is prevented from turning by a pin *p* engaging in its slot *l'*. The piston *l* is provided at its lower end with an opening *m*² and at its upper end with perforations *m'* corresponding to those of the sieve *h*. The piston *l* is rigidly connected with a spindle *o* having a collar *o*² and carrying a hand-wheel *o'*. By means of the hand-wheel *o'* the piston *l* can be pushed inward, so that its upper end projects into the trough *a*, as is shown at Figs. 1 and 5, and uncovers its perforations *m'*, while the opening *m*² below registers with the tubular connection *n*. By opening the stop valve *k'* the liquid in the vessel can be permitted to escape to without. If so preferred, the tubular piston *l* may be provided with suitable openings in place of the perforations *m'* and sieves may be disposed in these openings. Then the effect will be much the same as before.

Where so preferred, the above mentioned manhole may be replaced by a device shown at Fig. 4. In this case the cover *b* is provided with a cylindrical casing *r* of any suitable length, in which a distributor consisting of a shaft *u* with four radial wings *t t* fastened on it is mounted to turn, a suitable handle or crank (not shown) being fastened on one outer end of the shaft *u* for turning the distributor by hand. The casing *r* is provided with a cover *s*, which may be hinged to it as shown and secured by means of screws with winged nuts or the like.

The extracting apparatus described operates as follows: If the apparatus has no distributor, the cover *b* is taken off and the trough *a* is charged with a convenient quantity of crude rubber or other raw material, after which the cover is replaced. If, however, the apparatus has a distributor, its cover *s* is opened and the material is repeatedly charged into the space above the upper wings *t t* and discharged therefrom by turning the distributor, until a sufficient part of the vessel *a* is filled. Then the cover *s* is closed, and any of the known solvents employed for this purpose is introduced together with water through the tubular connection *f* and the respective stop valve (not shown) thereon is closed. Then the belt is shifted from the loose pulley *y'* or *y*² to the fast one for starting the apparatus and steam is turned on from any known source by means of suitable valves (not shown) through the inlet *i'* to the steam-jacket *i*. Care should be taken, that the material be heated only up to a temperature, which does not yet produce any decomposition of the

rubber. The heat supplied by the steam will help the solvent to act upon the material and this the more intensively, the finer the particles are into which the material is cut by the knives *e*. The solvent will extract the rubber or rubber-like substance and dissolve the resin. The gases and vapors developed during the process are permitted to escape through the tubular connection *g*. When the extraction is finished, the resulting liquid with the impurities is discharged from the trough by pushing inward the tubular pistons *l* of the liquid discharging valves and by opening the stop valves *k'*, while the sieves *h* and the perforations *m'* in the pistons *l* retain all the particles of rubber or rubber-like substance. The rubber or rubber-like substance left in the vessel *a* has been at the same time washed during the described operation and can be taken out of the vessel *a* for further treatment. In this manner the rolling into plates and the subsequent washing as hitherto employed is saved and the power for working the material is reduced.

The extracting apparatus can be varied in many respects without departing from the spirit of my invention.

I claim:

1. In a rubber extracting apparatus of the class described, in combination, a trough, bearings at the ends thereof, shafts rotatably mounted in said bearings, knives carried by said shafts, means to rotate said shafts, and sieves within said trough adjacent said bearings to keep them free from particles of the material being operated upon.

2. In a rubber extracting apparatus of the class described, in combination, a trough, bearings at the ends thereof, shafts rotatably mounted in said bearings, knives carried by said shafts, means to rotate said shafts, sieves within said trough adjacent said bearings to keep them free from particles of the material being operated upon, and protective means interposed between the sieves and the knives adjacent thereto to prevent the material from being pressed against the sieves by said knives.

3. In an apparatus for extracting rubber or rubber-like substances, the combination with a trough, of bearings in the end sides of said trough, sieves near said bearings on the inside of said trough adapted to retain particles of material, shafts parallel to one another and to the bottom of said trough mounted to turn in said bearings and passing through said sieves, knives juxtaposed on said shafts and adapted to work together similar to scissors, means for heating said trough, a cover on said trough, means for charging the raw material into said trough, means for introducing a solvent into said trough, means for

driving said shafts, means for permitting the gases and vapors developed to escape, and means for discharging the liquid from said trough while retaining the particles of rubber and the like.

4. In an apparatus for extracting rubber or rubber-like substances, the combination with a trough, of bearings in the end sides of said trough, sieves near said bearings on the inside of said trough adapted to retain the particles of material, shafts parallel to one another and to the bottom of said trough mounted to turn in said bearings and passing through said sieves, protecting disks on said shafts in proximity of said sieves, knives juxtaposed on said shafts between said protecting disks and adapted to work together similar to scissors, means for heating said trough, a cover on said trough, means for charging the raw material into said trough, means for introducing a solvent into said trough, means for driving said shafts, means for permitting the gases and vapors developed to escape, and means for discharging the liquid from said trough while retaining the particles of rubber and the like.

5. In an apparatus for extracting rubber or rubber-like substances, the combination with a trough, of bearings in the end sides of said trough, sieves near said bearings on the inside of said trough adapted to retain the particles of material, shafts parallel to one another and to the bottom of said trough mounted to turn in said bearings and passing through said sieves, protecting disks on said shafts in proximity of said sieves, knives juxtaposed on said shafts between said protecting disks and so disposed as to periodically and in groups work together similar to scissors, means for heating said trough, a cover on said trough, means for charging the raw material into said trough, means for introducing a solvent into said trough, means for driving said shafts, means for permitting the gases and vapors developed to escape, and means for discharging the liquid from said trough while retaining the particles of rubber and the like.

6. In an apparatus for extracting rubber or rubber-like substances, the combination with a trough provided with a steam-jacket, of bearings in the end sides of said trough, sieves near said bearings on the inside of said trough adapted to retain the particles of material, shafts parallel to one another and to the bottom of said trough mounted to turn in said bearings and passing through said sieves, knives juxtaposed on said shafts and adapted to work together similar to scissors, means for passing steam through said steam-jacket, a cover on said trough, means for charging the raw material into said trough, means for introducing a solvent into said trough, means for driving said

shafts, means for permitting the gases and vapors developed to escape, and means for discharging the liquid from said trough while retaining the particles of rubber and the like.

7. In an apparatus for extracting rubber or rubber-like substances, the combination with a trough provided with a steam-jacket, of bearings in the end sides of said trough, 10 sieves near said bearings on the inside of said trough adapted to retain the particles of material, shafts parallel to one another and to the bottom of said trough mounted to turn in said bearings and passing through 15 said sieves, protecting disks on said shafts in proximity of said sieves, knives juxtaposed on said shafts between said protecting disks and adapted to work together similar to scissors, means for passing steam 20 through said steam-jacket, a cover on said trough, means for charging the raw material into said trough, means for introducing a solvent into said trough, means for driving said shafts, means for permitting the gases 25 and vapors developed to escape, and means for discharging the liquid from said trough while retaining the particles of rubber and the like.

8. In an apparatus for extracting rubber or rubber-like substances, the combination 30 with a trough provided with a steam-jacket, of bearings in the end sides of said trough, sieves near said bearings on the inside of said trough adapted to retain the particles 35 of material, shafts parallel to one another and to the bottom of said trough mounted to turn in said bearings and passing through said sieves, protecting disks on said shafts in proximity of said sieves, knives juxtaposed

on said shafts between said protecting 40 ing disks and so disposed as to periodically and in groups work together similar to scissors, means for passing steam through said steam-jacket, a cover on said trough, 45 means for charging the raw material into said trough, means for introducing a solvent into said trough, means for driving said shafts, means for permitting the gases and vapors developed to escape, and means for 50 discharging the liquid from said trough while retaining the particles of rubber and the like.

9. In a rubber extracting apparatus of the class described, the combination with a cylindrical casing adapted to be fastened with 55 one end on a trough and having a tubular connection on one side, of a tubular piston closed at both ends guided in said cylindrical casing and having perforations in its walls near one end and an opening near the 60 other end, means for preventing said tubular piston from turning, a stuffing-box at the other end of said cylindrical casing, a spindle guided in said stuffing-box and rigidly connected with one end of said 65 tubular piston, and stops limiting the stroke of said tubular piston, so that in one extreme position the inner end of the piston projects into the trough and discloses its perforations and the opening at the other 70 end of the piston registers with said tubular connection, while in the other extreme position the inner end of the piston approximately flushes with that of said casing.

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