(No Model.) 2 Sheets—Sheet 1.

M. RAABE & F. H. ZIMMERMANN.

MACHINERY FOR BREAKING FIBROUS PLANTS AND SEPARATING OUT THE FIBERS.

No. 342,631. Patented May 25, 1886.

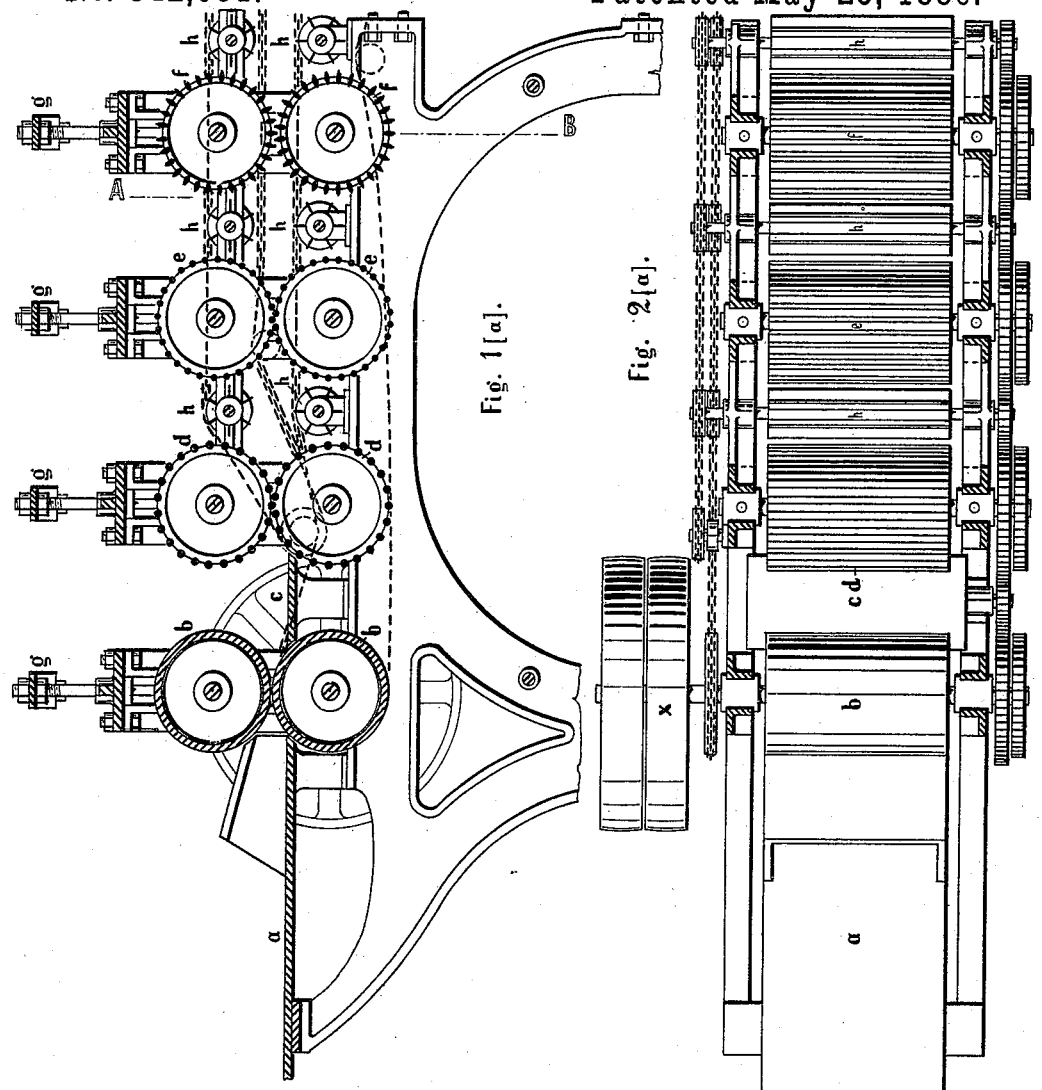

Fig. 1[a].

Fig. 2[a].

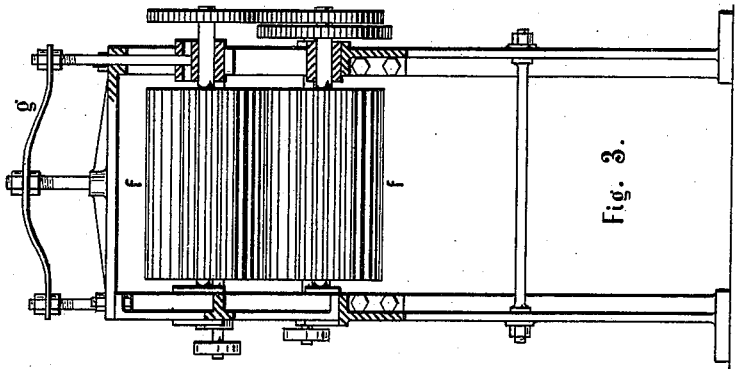

Fig. 3.

Witnesses:
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H. B. Hedrick

Inventors:
Max Raabe and
Friedrich H. Zimmermann
by Marcellus Bailey
their attorney

(No Model.) 2 Sheets—Sheet 2.

M. RAABE & F. H. ZIMMERMANN.

MACHINERY FOR BREAKING FIBROUS PLANTS AND SEPARATING OUT THE FIBERS.

No. 342,631. Patented May 25, 1886.

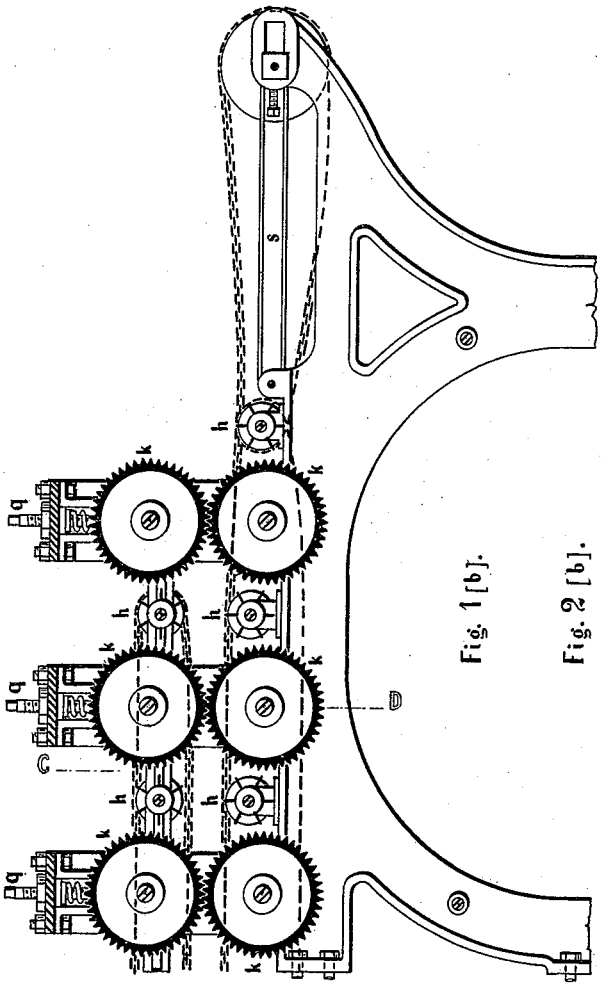

Fig. 1 [b].

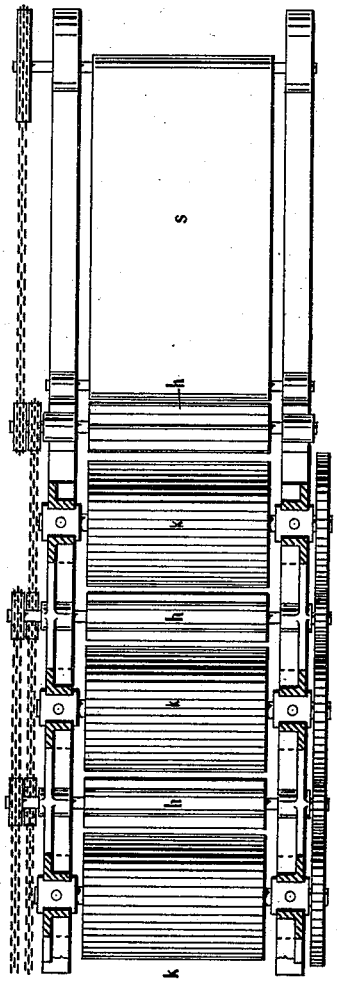

Fig. 2 [b].

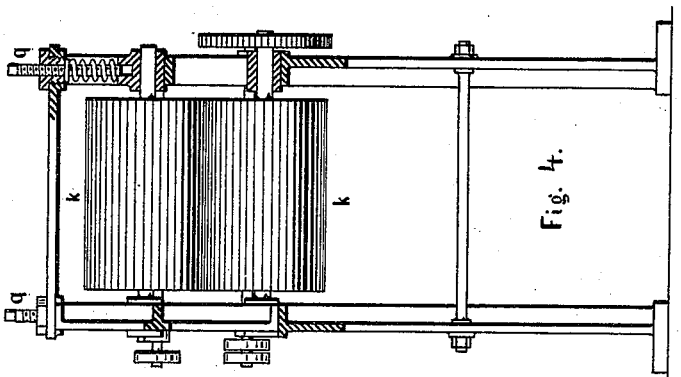

Fig. 4.

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UNITED STATES PATENT OFFICE.

MAX RAABE AND FRIEDRICH HEINRICH ZIMMERMANN, OF HALLE-ON-THE-SAALE, PRUSSIA, ASSIGNORS OF ONE-HALF TO FRANZ RAABE, OF EUTRITZSCH, NEAR LEIPSIC, AND FRIEDRICH W. I. HOUCKES, OF LEIPSIC, GERMANY.

MACHINERY FOR BREAKING FIBROUS PLANTS AND SEPARATING OUT THE FIBERS.

SPECIFICATION forming part of Letters Patent No. 342,631, dated May 25, 1886.

Application filed February 16, 1886. Serial No. 192,125. (No model.)

To all whom it may concern:

Be it known that we, MAX RAABE and FRIEDRICH HEINRICH ZIMMERMANN, both subjects of the King of Prussia, and residing in Halle-on-the-Saale, Kingdom of Prussia, German Empire, have invented new and useful Improvements in Machinery for Breaking Fibrous Plants and Separating out the Fibers, whereof the following is a specification.

Our invention relates to machinery for breaking fibrous plants and separating out the fibers by means of rolls; and the improvements consist in making the periphery of the main breaking-rolls of round-faced bars, having between them slits for the passage of the chaff produced by the breaking-operation, the faces of the bars being of different width in the different pairs of coacting-rolls.

Moreover the improvements consist in the combination, with the said rolls, of a pair of smooth rolls first receiving the stalks of the plants, of a series of corrugated rolls serving to detach the back and resinous parts of the stalks and separating the fibers from each other, and of beaters adapted to beat out from the fibers the loose chaff adhering thereto.

A machine constructed according to our invention is represented on the annexed two sheets of drawings—

Figure 1, divided into 1^a and 1^b, being a longitudinal section; Fig. 2, divided into 2^a and 2^b, a plan; and Figs. 3 and 4 transverse sections on the lines A B and C D, respectively.

The material to be treated is spread out and conducted to the first pair of rolls, *b*, on a table, *a*. The said rolls have a smooth surface, and they are so adjusted in respect to each other that they will slightly compress the stalks, but without crushing them. From the rolls *b* the material is conducted to the second pair of rolls, *d*, by a table, *c*. These rolls and the rolls of the following pairs, *e* and *f*, consist of bars fixed to the periphery of disks keyed on an axle, the said bars presenting to the material to be treated a round face, which in each succeeding pair of rolls is narrower than in the preceding one. Thus the rolls *d* are made with round bars of a diameter of one-half or five-eighths of an inch. The following pair, *e*, may also have round bars, but these are thinner than those of the rolls *d*. The bars of the third pair, *f*, which require to have still narrower operating-faces, are preferably made of elliptical section, and they are fixed edgewise to the disks. The bars of the upper rolls of each of the pairs *d*, *e*, and *f* mesh with those of the corresponding lower rolls, but so that a small space is left between the co-operating bars for the passage of the material. The lower rolls are mounted in fixed bearings, whereas the upper rolls rotate in bearings movable between vertical guides, and which are suspended by adjusting-screws to springs *g*, in order to prevent the upper rolls from meshing too closely with the lower rolls, and from crushing the material to an injurious extent. The rolls are driven by a pulley, *x*, which may be keyed on the axle of the lower roll *b*, motion being conveyed from this axle to the lower rolls *d e f* by a series of spur-wheels, while other spur-wheels, gearing accurately with each other, connect the lower rolls with the respective upper ones.

Between the rolls *d* and *e*, *e* and *f*, and also between *f* and the following rolls, *k*, which will be described hereinafter, are placed beaters *h*, consisting of a shaft with ribs or ledges, and which rotate with suitable speed in the same sense as the rolls with which they co-operate. These beaters serve to convey the material from one pair of rolls to the other, to shake the same during its passage, and to beat out therefrom the ligneous particles having become loose by the action of the rolls. In the drawings such beaters are shown as being arranged between the upper rolls as well as between the lower ones; but the upper beaters may be left away, as with the lower ones alone the desired effect may also be attained. The said beaters may be driven by chains and sprocket-wheels.

The operation of the described pairs of rolls is as follows: The first rolls, *b*, slightly flatten the stalks and crack them lengthwise. The second rolls, *d*, break the ligneous portions of the stalks transversely, but not so much as to injure the fibers. By the third rolls, *e*, the reduction of the said portions is carried fur-

ther, and by the fourth rolls, *f*, it is substantially completed. The chaff produced by these successive operations is partly separated out from the fibers by the rolls themselves in passing through the slits of the same; partly it is removed by the beaters *h*. By the rolls *f* the treatment of the material is, however, not finished, as portions of bark and hard resinous substances still adhere to the fibers. For reducing and detaching these, and for separating the fibers from each other and rendering them softer, the material is passed between a plurality of pairs of rolls, *k*, (in the drawings only three pairs are shown,) having comparatively narrow longitudinal corrugations or grooves, which in the co-operating rolls mesh with each other. The said rolls *k* may have beaters *h* combined with them in like manner as the rolls *b d e f;* but the rolls *k* will also work without beaters, provided they be placed sufficiently close together as that the material may pass directly from one pair of rolls to the other. The upper ones of the rolls *k* are mounted in movable bearings that are pressed down by springs *g*, the tension whereof is adjustable by means of screws. From the last pair of rolls *k* the finished material falls on a traveling delivery-cloth, *s*.

Of the grooved rolls *k* only the lower ones require to be driven by wheel-work. If preferred, the portion of the machine containing the said rolls *k* may be detached from the portion in which the rolls *b d e f* are mounted. The number of rolls of either portion may be varied, and instead of constructing all the pairs of rolls *d e f* with bars of different width of face, there may be two or more pairs, *d* or *e* or *f*, having bars of like description.

We claim as our invention—

1. In a machine for treating fibrous plants, in view of separating out the fibers, the combination, with each other, of a pair of smooth rolls, *b*, and a varying number of pairs of rolls, such as *d e f*, whose periphery is constructed of round-faced bars, having between them slits and meshing with the bars of the co-operating rolls, the said faces in any succeeding pair or pairs of rolls being narrower than in the preceding pair or pairs, substantially as and for the purpose described.

2. The combination, with the smooth rolls *b* and a number of pairs of rolls, such as *d e f*, constructed with round-faced bars having between them slits, of a plurality of pairs of grooved rolls *k*, meshing with each other, substantially as and for the purpose specified.

3. The combination, with the smooth rolls *b*, the rolls *d e f*, constructed with round-faced bars having between them slits, and the grooved rolls, *k*, or with any of the said rolls, of rotating-beaters *h*, substantially as hereinbefore set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

MAX RAABE.
FRIEDRICH HEINRICH ZIMMERMANN.

Witnesses for Max Raabe:
AUGUSTUS CHARLES GUSTAVUS SKYNNER,
RALPH CIBROY.
Witnesses for Friedrich Heinrich Zimmermann:
FRIEDRICH W. I. HOUCHET,
FRANZ RAABE.