

No. 730,617.

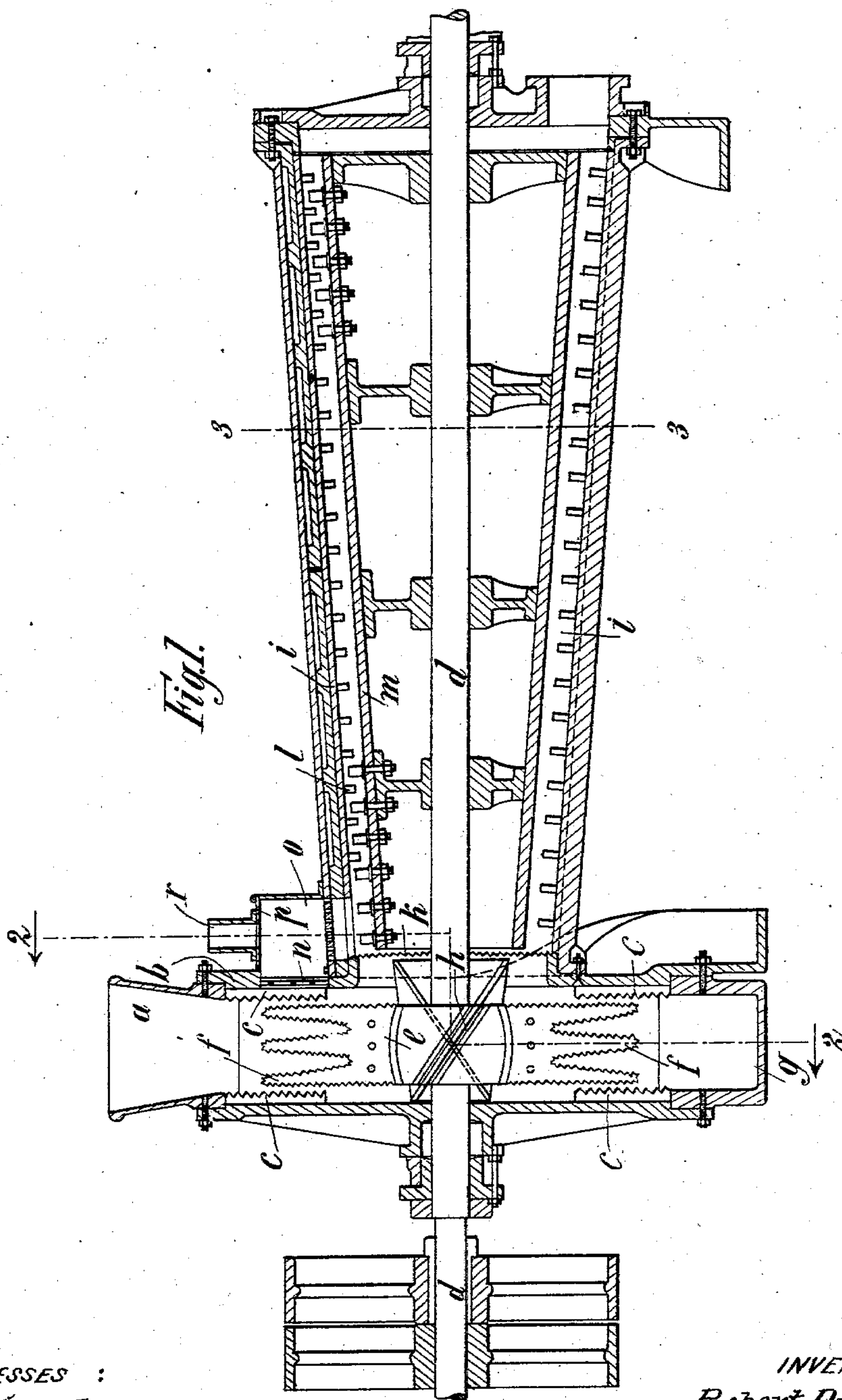
PATENTED JUNE 9, 1903.

R. DIETRICH.
DEVICE FOR GRINDING BROKEN PAPER.

APPLICATION FILED SEPT. 2, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES :

W. M. Avery
Rev. J. Hostetler

INVENTOR

Robert Dietrich

BY

Wm. D.

ATTORNEYS.

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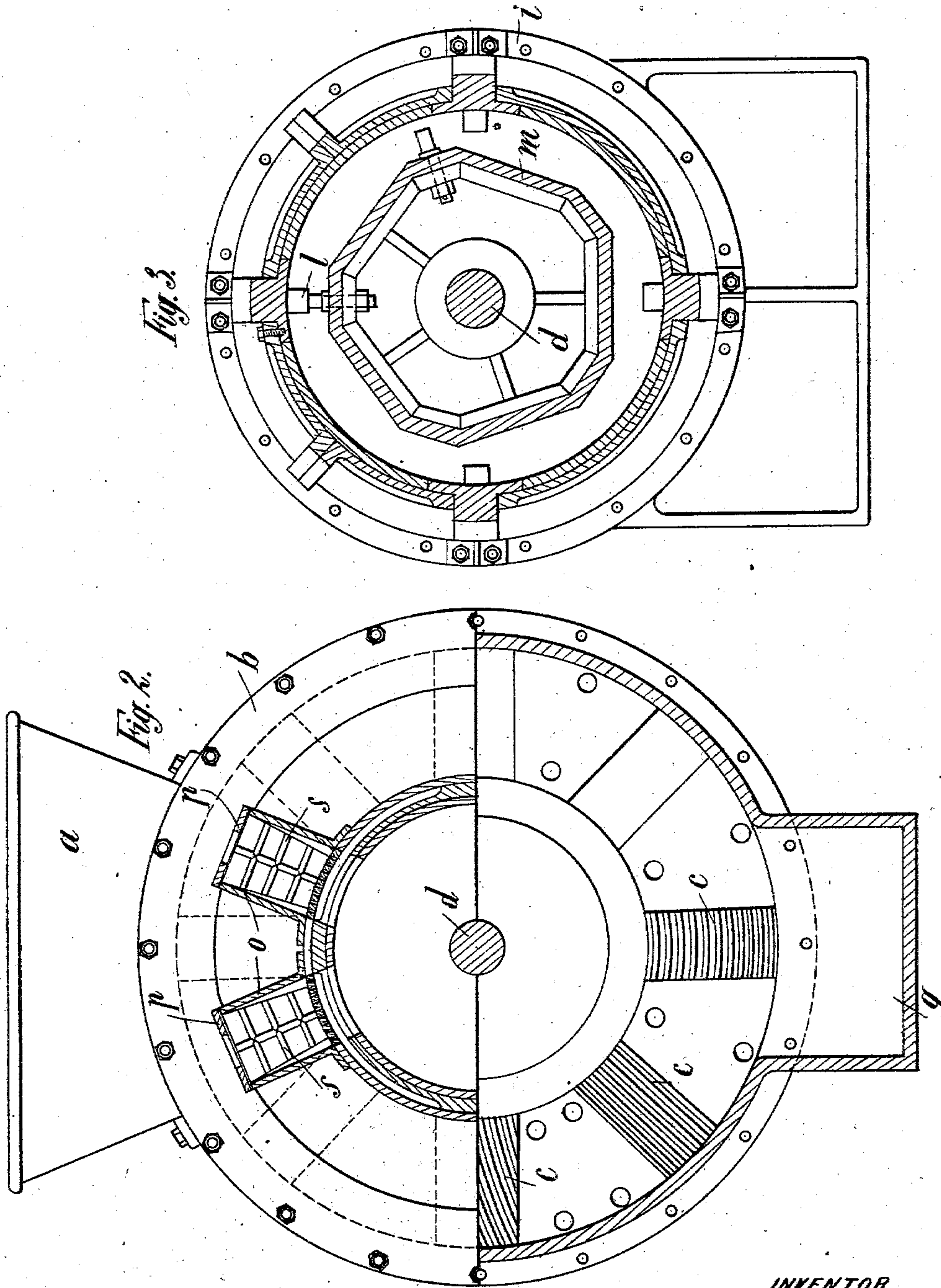
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WITNESSES :

W. M. Avery
Rev. J. H. Foster

INVENTOR

Robert Dietrich

BY

Mumford

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ROBERT DIETRICH, OF MERSEBURG, GERMANY.

DEVICE FOR GRINDING BROKEN PAPER.

SPECIFICATION forming part of Letters Patent No. 730,617, dated June 9, 1903.

Application filed September 2, 1902. Serial No. 121,769. (No model.)

To all whom it may concern:

Be it known that I, ROBERT DIETRICH, manufacturer, a subject of the King of Prussia, German Emperor, residing in the city of Merseburg, Kingdom of Prussia, German Empire, have invented a certain new and useful Device for Grinding Broken Paper and the Like in the Manufacture of Paper, of which the following is a specification.

This invention has reference to a kneading and mixing machine suitable for the perfect combination and grinding of so-called "broken" paper, cellulose, ground wood, and similar material for the manufacture of paper. My invention is superior to the devices of this kind as heretofore employed by the chips of paper being caught and pulled into the device with absolute reliability, so that an abundant supply of a good and uniform pulp can be obtained in a short time ready to go on the paper-machine.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal sectional elevation of the improvement. Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 1, and Fig. 3 is a like view of the same on the line 3 3 of Fig. 1.

Referring to the drawings, *a* is a hopper through which the raw material is fed into the mixing-cylinder, forming part of the machine and arranged underneath the said hopper. The cylindrical casing *b* is provided at the interior of its side walls with several plates or rows of toothed knives *c*. As will be seen from Fig. 2, the knives, blades, teeth, and the like may be differently arranged upon their base-plates, which are preferably mounted upon the walls, so as to insure perfect grinding. The driving-shaft *d* passes longitudinally through the machine and is provided at the inside of the casing *b* with a screw-shaped kneading device *e*, the wing-shaped parts of which may be compared to arms and hands and are fitted with indentations *f* at their extremities. By means of these prongs, teeth, points, or indentations the kneading-screw with its projections reach-

ing into the freshly-fed mass of broken paper will be sure to catch all the particles of the material and carry them along with it. Any coarser impurities, knots, particles of iron chips, and other foreign matter which might have got into the material, fed to the kneader by accident, has to be separated out at the proper time, so as to avoid breaking the knives and wings. For this purpose I provide at the bottom of the casing *b* a stone-catching basin or knot-receptacle *g*, into which all the heavy particles, stones, iron, and the like will drop beyond the reach of the wings, which will thereby be unable to carry them up again. The hub of the kneading-screw between the wings is provided with separate screw-threads *h*, by means of which the material is carried along in the direction of the right-hand side of the drawings. The kneading-screw *e*, with its wings, is preferably so arranged as to make ninety to one hundred revolutions a minute. At this rapid rotation a volume of air accumulates beneath the upper thicker portion of the mass of broken paper contained in the hopper, this air which collects in the casing *b* being subjected to a steadily-increasing pressure. In other parts of the mass a partial vacuum is formed. These inconveniences greatly interfere with the taking out of the light paper-pulp and with its being fed to the conical drum *i* by the delivery-opening at the right-hand side of the casing. In order to overcome this difficulty and in order to insure absolute reliability of working, provision is made whereby the variations in the pressure of the air consequent upon the blows of the wings *f* within the casing are counterbalanced, thereby insuring the absolutely uniform movement of the comminuted parts of broken paper. With this end in view the rim of the casing *b*, which projects beyond the drum *i*, is provided with one or more openings *n* above the drum and between the grinding-plates *c*. Air-boxes *o* are rigidly secured in place in front of these openings, the said air-boxes opening into the drum and being preferably provided at their upper parts *p* with pipes *r*, through which the air may escape from the casing or through which any rarefaction of the air may be compensated.

By the interposition of the said boxes *o* the pulp is prevented from entering into the pipes for the escape of the air. The delivery-openings *n*, leading from the casing *b* to the boxes *o*, are covered with grates or sieves *s*, which allow the comminuted pulp to pass through, while the crude chips of broken paper are retained, the pulp after being ejected from the casing being allowed to drop from the boxes into the drum. The combination with the said lateral boxes presents the further advantage of catching and retaining any parts of ropes, strings, rags, and the like which might have got into the hopper with the broken paper to the ground. These long-fibered impurities if allowed to pass through all the other stages of manufacture are liable to choke up the knotters or strainers, inasmuch as they are usually not sufficiently disintegrated by the short grinding in the beater-engine.

Grates *s s* are attached to the openings *n* and between the grinding-plates. Any parts of strings and of similar long fibrous impurities which have not yet been removed by being twisted about the arms of the kneading-screw will be caught at these grates and be retained thereby. The lids *p* of the boxes may then be swung open and the attendant can reach through the open box *o* and get at the grate *s* and remove any particles which have adhered to said grates by hand even while the machine is in operation. The cleaning of the kneading-screw, however, has to be effected while the machine is stopped.

After the chips of broken paper have been prepared by the means above described they are passed for their final treatment to the conical drum *i*, the narrower end of which is fitted around the delivery-opening of the kneading device *e*, so that the material may be conveniently caught and acted upon by the special attachments of the shaft *d*. Grinding-knives and the like, similar to those of the mixing-cylinder, are provided at the end wall *k* of the drum next to the mixer. The drum may be round or polygonal and is provided at the inside of its casing with several rows of knives, teeth, prongs, or with similar projections *l*, reaching into the interior of the drum and placed longitudinally, while the framework *m*, which is mounted upon the longitudinal shaft *d*, is also provided with a similar arrangement of knives or teeth, which enter into the spaces between the projections on the outer drum-casing. Both parts of the drum are closer together toward the rear end of the machine.

In the device arranged as above described the chips of broken paper which are fed through the hopper are sure to be caught by the indented or cut-out arms or wings of the kneading-screw of the first-described part. They are then carried around and are nicely cut by the attachments of the shaft and by the aid of the knives and teeth of the grinding-plates and without leaving a residue, the

process being greatly assisted by filling the casing partially with water. In view of the absolutely-reliable action of the grinding parts there is no possibility of sticking of parts of paper, as it is of frequent occurrence in other devices used for this purpose. After the material has been sufficiently disintegrated the material from which the impurities have been separated out in the stone-catching basin is transferred to the adjoining drum and is passed between the prongs or projections of the casing of the same and those of the framework mounted on the shaft. The previously-ground soaked mass, which is free from impurities, is submitted to a thorough crushing action and to thorough kneading with a minimum of power and leaves the broader end of the drum as a uniform pulp ready for further treatment on the paper-machine or in the tub.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. Machine for comminuting broken paper, and similar material for the manufacture of paper, comprising the combination of a mixing-cylinder *b*, the shaft *d* of which is provided with wings *f* for mixing and tearing up the material, and a feeding-screw *h* with a conical kneading-drum *i*, the narrower end of which is attached to the mixing-cylinder.

2. Machine for comminuting broken paper, consisting of a mixing-cylinder with wings *f* upon a shaft, and finger-shaped projections on the said wings which are cut out to form blades, in combination with grinding-plates at the side walls of the casing, which plates are provided with cutters and in combination with a conical kneading-drum for the reception of the comminuted mixture.

3. Comminuting-machine for broken paper, comprising the combination of a mixing-cylinder with a conical kneading-drum and a feeding-screw *h* upon a common shaft and delivering means extending in the direction of the conical drum.

4. Comminuting-machine for broken paper comprising in combination a mixing-cylinder with wings upon the shaft of the same, the ends of the wings being cut out, and grinding-knives fastened to plates at the walls of the cylinder, and a kneading-drum, the narrower end of which is attached to the said cylinder, the shaft and the outer wall being provided with projections *l*, *m*, the distance between the outer wall and the rotating part decreasing toward the rear end.

5. Machine for comminuting broken paper, comprising in combination a mixing-cylinder with cutting-blades upon the shaft and comminuting and cutting knife-plates upon the inner walls and a kneading-drum, the end wall *k* of which next to the cylinder is also provided with cutting means.

6. Machine for comminuting broken paper, comprising in combination a mixing-cylinder and an adjoining kneading-drum, with openings *n* in the upper part of said cylinder and

boxes *o* arranged upon the drum *i* and in front of the said openings, and air-pipes *r* on said boxes.

7. Machine for comminuting broken and waste paper, comprising in combination a mixing-cylinder in a casing and an adjoining conical kneading-drum, and air-boxes *o* upon the said drum with openings *m* in the upper part of the said casing in front of the air-boxes, and grates *s* in front of the openings and swinging lids *p* upon the boxes.

8. Machine for comminuting broken and waste paper comprising in combination a mixing-cylinder *b* with wings and screw upon the shaft *d*, a conical kneading-drum fitting around the delivery-opening of the mixing-cylinder, and a receptacle, basin or box for retaining stones *g* below the mixing-cylinder for the purpose of depositing and separating the heavier particles from the waste.

9. A machine of the class described, comprising a kneading device and a mixing device, the kneading device having a casing at the apex end of the conical shell of the mixing-machine, knives on the inner faces of the heads of the casing, a driven shaft extending centrally through the casing and the shell, a kneading device on the shaft within the casing, and a plug on the shaft within the said shell, as set forth.

10. A machine of the class described, comprising a kneading device and a mixing device, the kneading device having a casing at the apex end of the conical shell of the mixing-machine, knives on the inner faces of the heads of the casing, a driven shaft extending centrally through the casing and the shell, a kneading device on the shaft within the cas-

ing, a plug on the shaft within the said shell, and air-boxes having grated openings in their sides leading into the casing and openings in the bottom leading into the shell, as set forth.

11. A machine of the class described, provided with a cylindrical casing having a feed-hopper, spaced knives on the inner faces of the heads of the casing, and a revoluble screw-shaped kneading device within the casing, having wings provided with indentations, as set forth.

12. A machine of the class described, provided with a cylindrical casing having a feed-hopper, spaced knives on the inner faces of the heads of the casing, and a revoluble screw-shaped kneading device within the casing, having wings provided with indentations, the said kneading device having its hub provided with screw-threads between the said wings, for carrying the material through a central opening in one of the heads of the casing, as set forth.

13. A machine of the class described, provided with a cylindrical casing having a feed-hopper, spaced knives on the inner faces of the heads of the casing, a revoluble screw-shaped kneading device within the casing, having wings provided with indentations, and air-boxes outside of one of the heads, having grated openings extending through the head into the interior of the casing, as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ROBERT DIETRICH.

Witnesses:

FREDERICK J. DIETZMAN,
B. H. WARNER, Jr.