

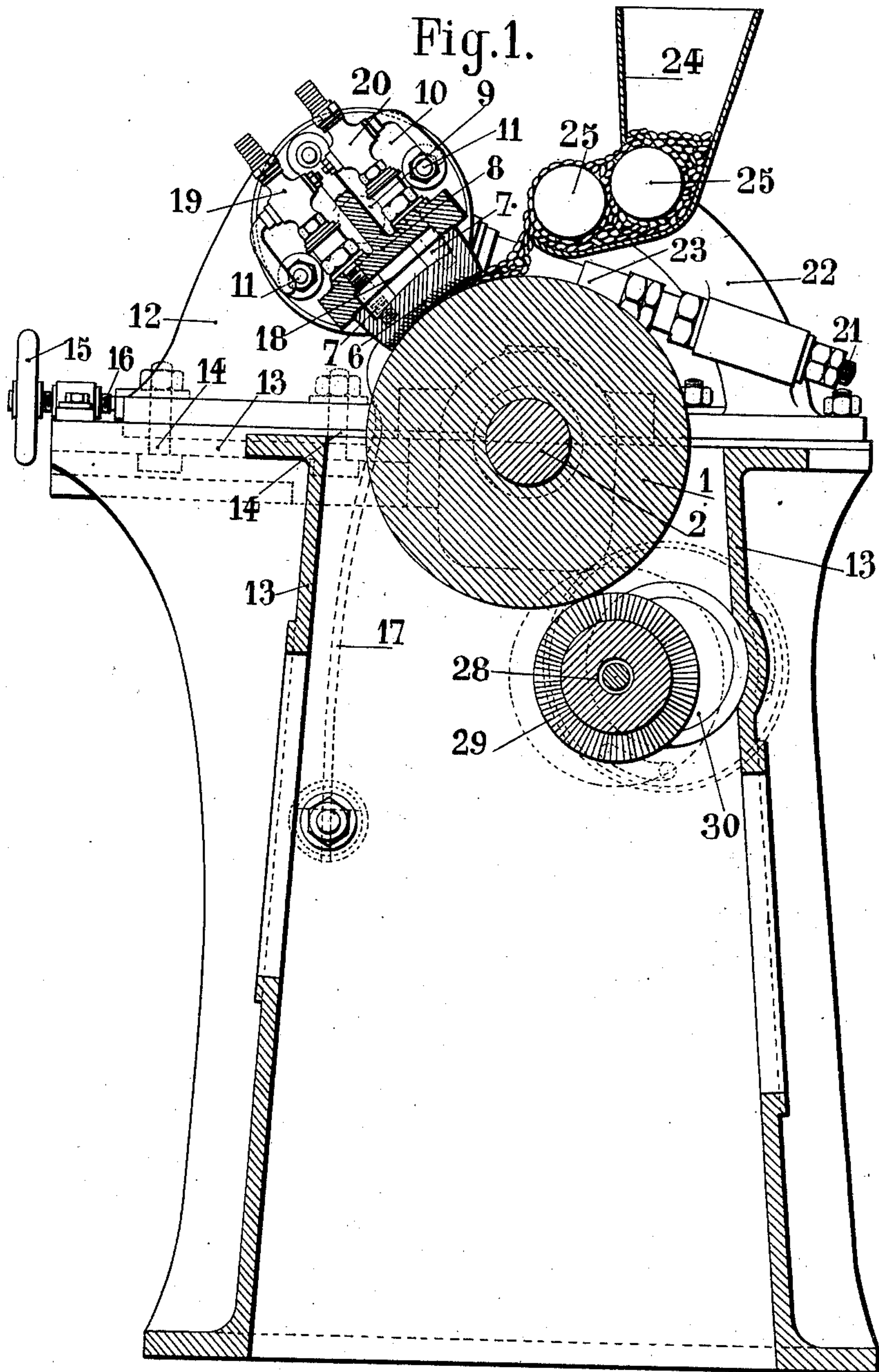
I. A. CHAVANNE & B. OLLAGNIER.  
METHOD OF AND APPARATUS FOR GRINDING CEREALS.

APPLICATION FILED JAN. 29, 1906.

990,705.

Patented Apr. 25, 1911.

5 SHEETS—SHEET 1.



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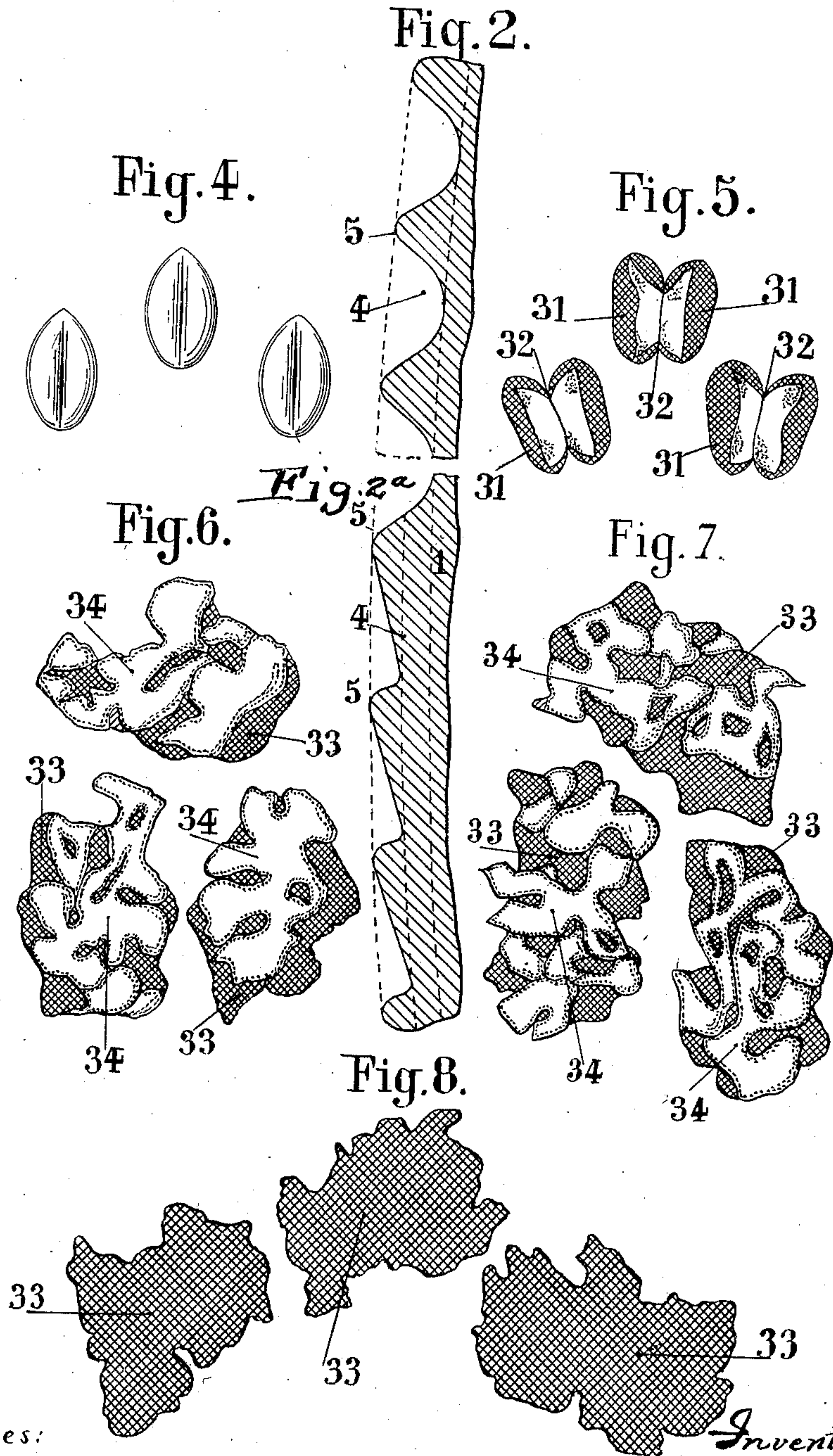
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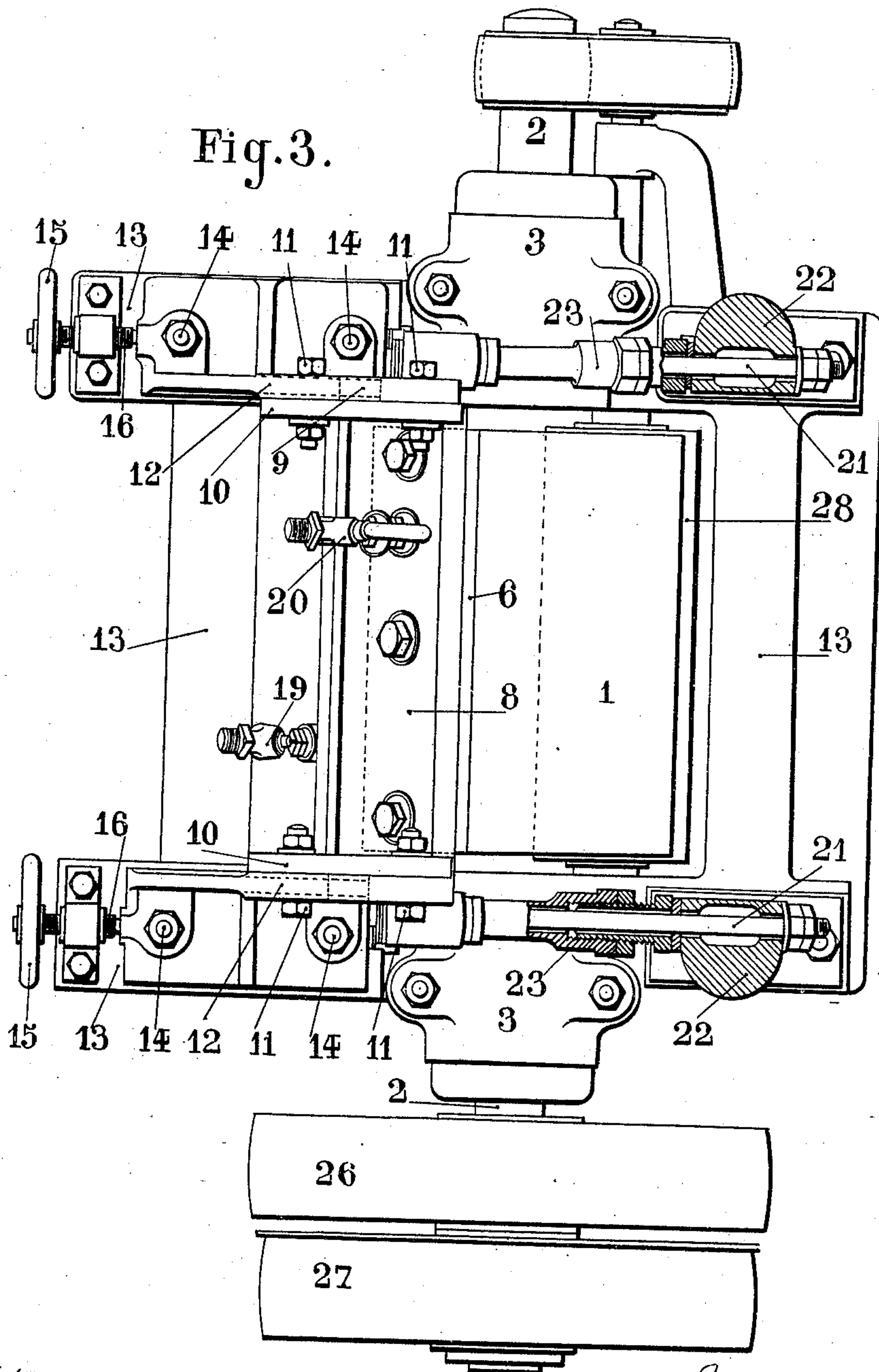
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5 SHEETS—SHEET 3.



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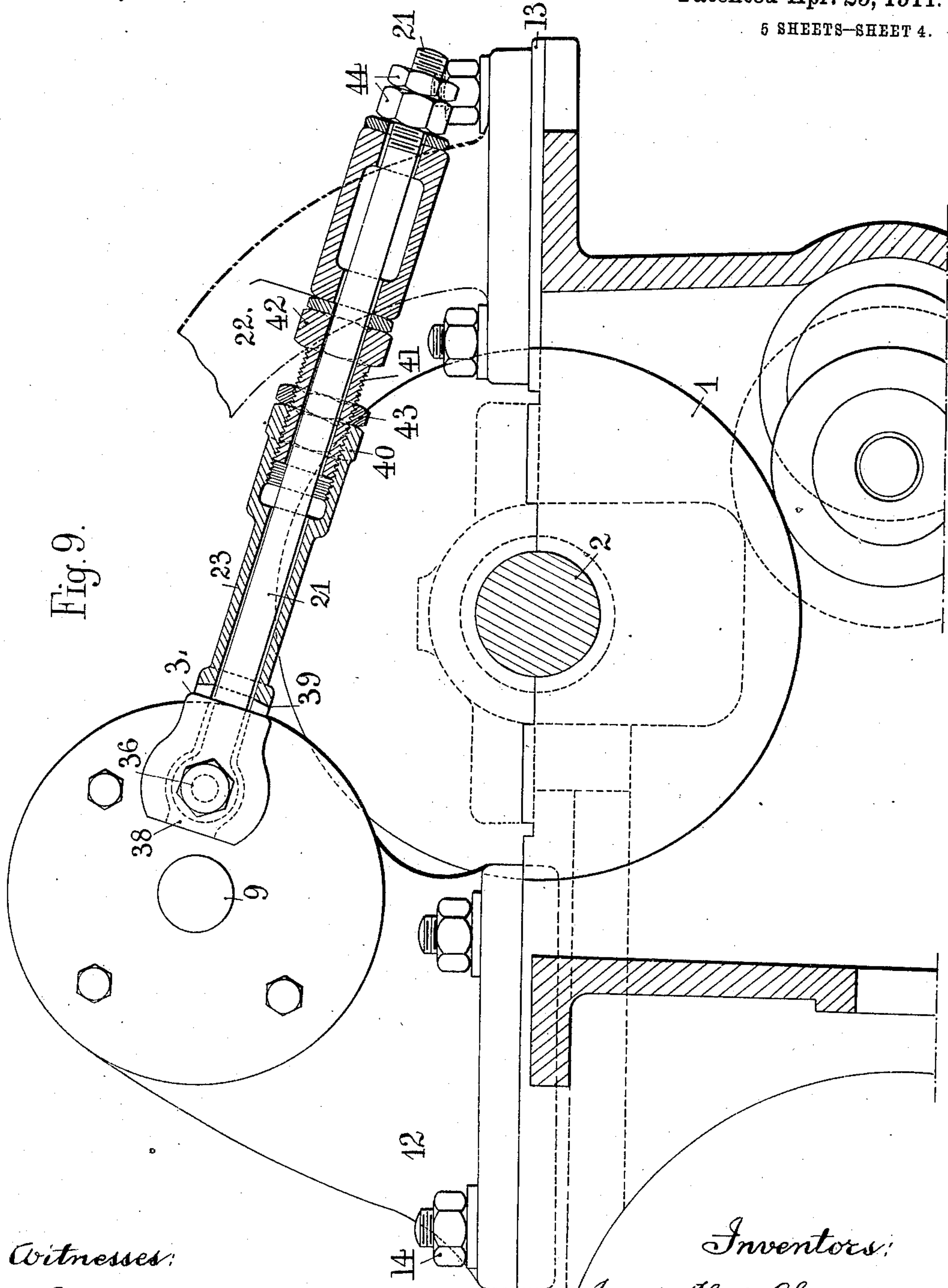
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5 SHEETS—SHEET 4.

990,705.



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5 SHEETS—SHEET 5.

Fig. 11.

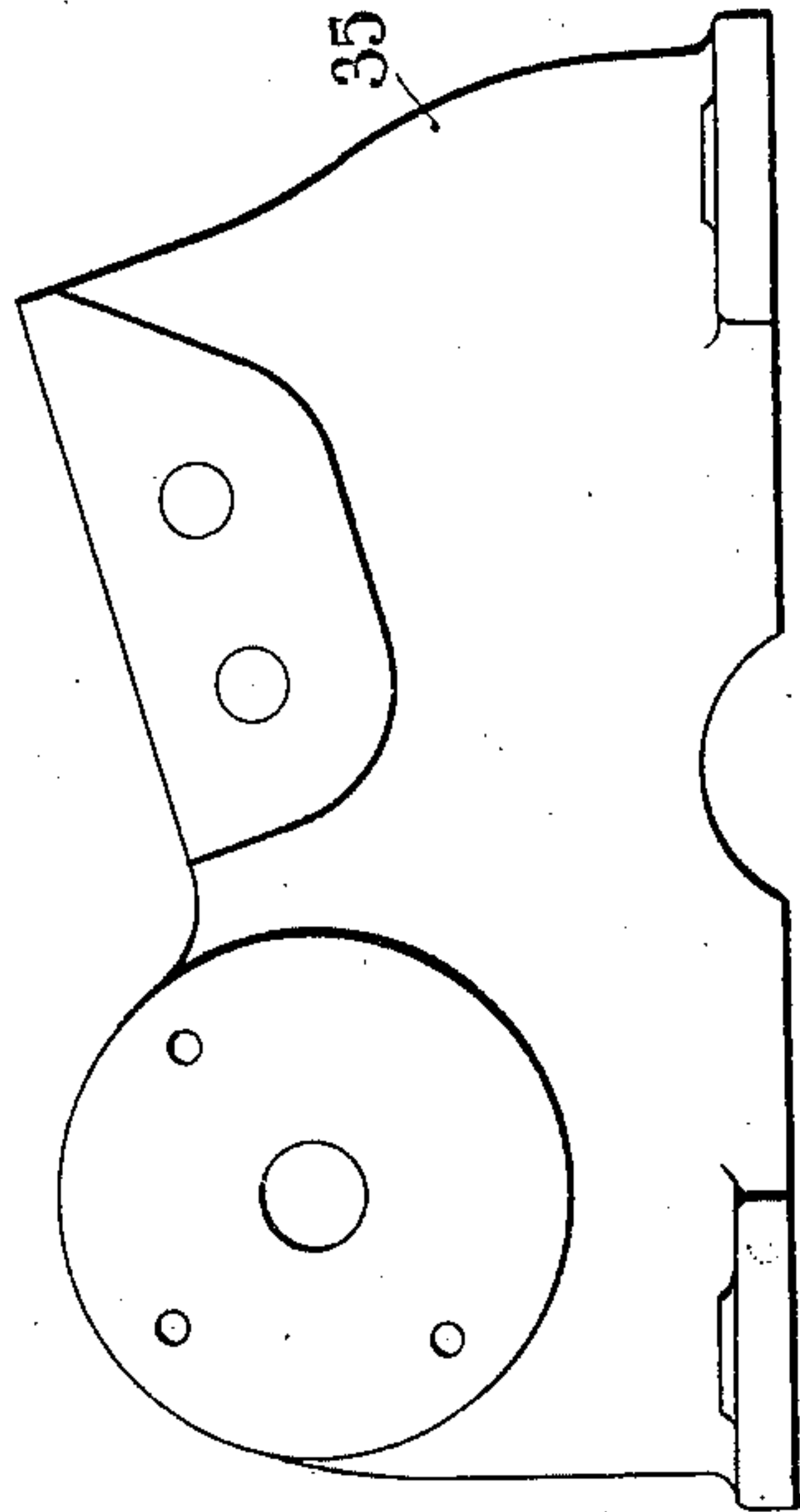
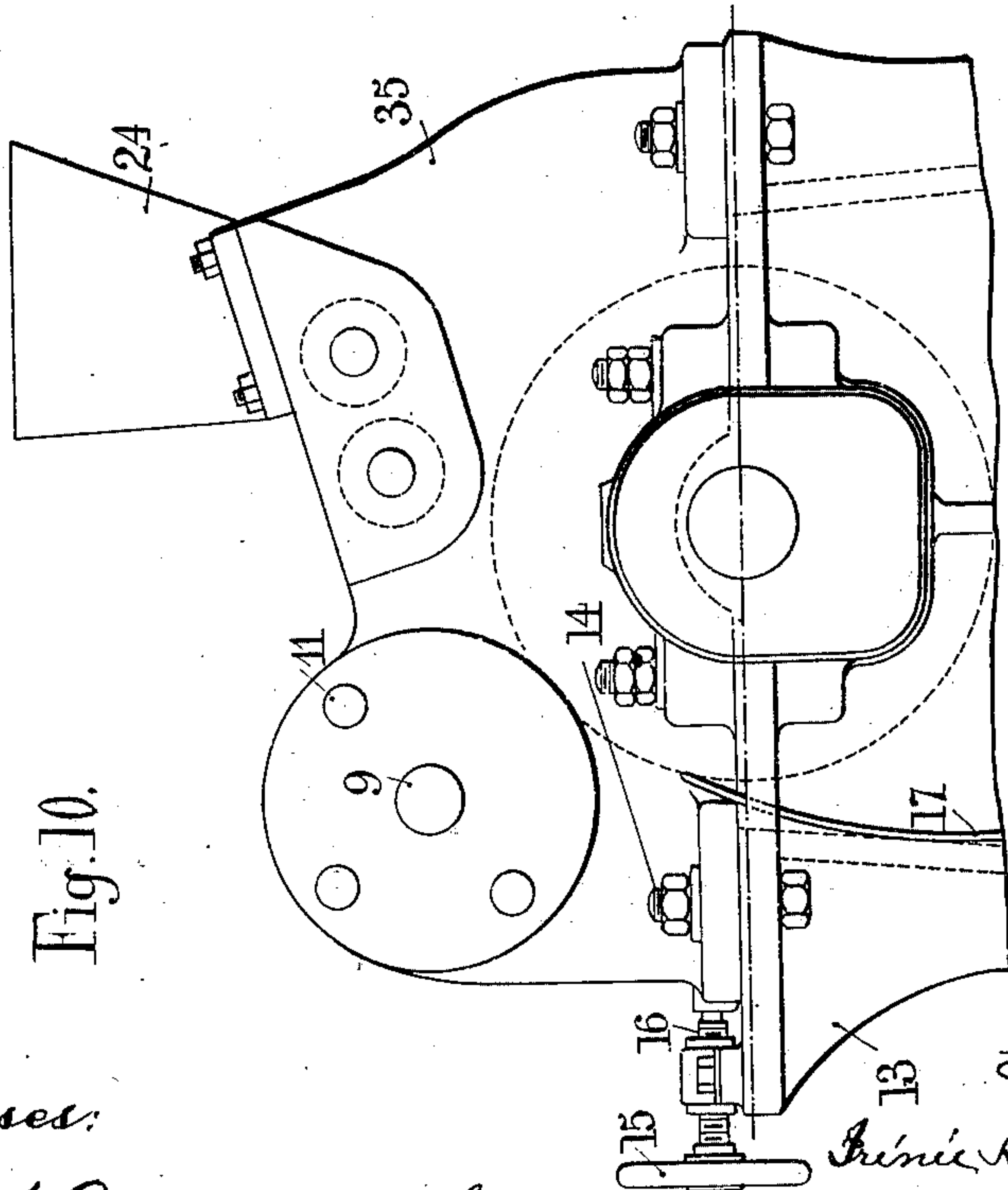


Fig. 10.



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# UNITED STATES PATENT OFFICE.

IRÉNÉE ALEXIS CHAVANNE AND BARTHÉLEMY OLLAGNIER, OF ST.-CHAMOND, FRANCE.

METHOD OF AND APPARATUS FOR GRINDING CEREALS.

990,705.

Specification of Letters Patent.

Patented Apr. 25, 1911.

Application filed January 29, 1906. Serial No. 298,568.

*To all whom it may concern:*

Be it known that we, IRÉNÉE ALEXIS CHAVANNE and BARTHÉLEMY OLLAGNIER, both of St.-Chamond, Loire, France, have  
5 invented a new and useful Improvement in Method of and Apparatus for Grinding Cereals, which improvement is fully set forth in the following specification.

This invention relates to apparatus for  
10 carrying out a very efficient method of cold grinding, the operation being carried out in a single cylinder mill to be described below.

It is necessary to bolt and grade after  
15 each passage of the material through the mill; the results of the various operations of this method of grinding may be summarized thus: 1. The grain is split longitudinally in such a manner as to open it, its two lobes  
20 remaining attached by a portion of the envelop which acts as a hinge. This operation has for its object to free the grain from the germ and from the impurities and dust contained in the longitudinal furrow which  
25 may give a bad color to the flour. 2. The split grains are successively rolled out for the extraction of semolina and dust. 3. The semolina is converted into dust and the dust into flour.

30 The apparatus consists of a mill in which the wheat is gradually reduced to flour by successive passages between slowly rotated rollers and fixed segments, the working surfaces of which are smooth and hard. The  
35 space between the working surface of each segment and its corresponding roller is progressively diminished from the entrance to a certain distance from the outlet after which the space remains constant.

40 The surface of each cylinder is provided with grooves or channels formed parallel to its axis. These grooves are always formed with rounded edges and not with cutting edges as in the cylinders heretofore employed. From the first phase of the operation  
45 until the end of the second, the type of groove remains symmetrical and constant but the number varies and increases. For the last phase they are still more numerous  
50 and are unsymmetrically formed. Owing to the shape of the grooves the grain is neither

ground nor sheared in any of these operations. It is never submitted to more than the pressure necessary to obtain the maximum useful effect.

In the splitting operation, the grains carried forward by the grooves on the rollers (the shape of the grooves causing them to be divided in the direction of their length) are merely split along their longitudinal  
60 furrow, without being ground, and on their exit from the machine the two lobes of each grain are still united by a portion of the envelop as by a hinge.

The grains being neither ground nor cut  
65 to pieces, the germ always remains entire at the end of this splitting operation after which its removal is easy without the fear of portions being torn off and remaining finally admixed with the flour or dust.

In the rolling operation the envelop of the grain is rolled out without being divided; this facilitates the extraction of the semolina and dust and thus allows the maximum quantity thereof to be obtained.

In order to insure the perfect regulation of the fixed segment with respect to its roller and to avoid irregularity in working, the mill is provided with a special arrangement of tie rods and tie pieces or supports provided with regulating screws for regulating  
80 with very great precision the distance of the segment from the roller; moreover, the segment is provided with a water circulation which by preventing accidental heating of  
85 any portion, avoids local deformations.

The accompanying drawings illustrate one method of carrying out this invention and the results obtained.

In these drawings Figure 1 is a longitudinal section of a mill made in accordance with this invention. Figs. 2 and 2<sup>a</sup> are fragmentary sections on a larger scale, Fig. 2 showing the type of groove employed during the passage of the grain for the first  
90 two phases of the grinding and Fig. 2<sup>a</sup> that employed during the passage of the grain in the third phase. Fig. 3 is a plan view partly in section of the mill shown in Fig. 1. Figs. 4, 5, 6, 7 and 8 show the effect of the different  
95 operations upon the grain. Fig. 9 is a detail view in sectional elevation of the means



for positioning the segment and roller; Fig. 10 a side elevation of the upper part of the frame and adjacent parts, and Fig. 11 a detail view in elevation of the same without the adjacent parts.

The mill for effecting these operations consists of a roller 1 of hardened cast iron, the shaft 2 of which rotates in bearings 3. The rollers employed for the operation of splitting the grain and rolling out the envelop have on their working surface, grooves, such as shown at 4 in Fig. 2, arranged parallel to the axes of the cylinders. As shown in this figure the edges of these grooves are rounded at 5. For the first and second phases the shape of the grooves remains the same, but their number increases as the grinding proceeds. For the third phase the grooves are made unsymmetrical as shown in Fig. 2<sup>a</sup>; but their edges are always rounded and have a small portion at the outer circumference flat. In other words, there are interposed between the grooves of the roller rounded ridges.

Above the roller 1 is placed at a varying distance, a segment 6 of cast iron, the working surface of which is smooth and hardened. This segment is fixed by screws 7 to the T shaped carrier 8, which is provided with journals 9 and circular flanges 10 for allowing it to be fixed at the required angular position upon supports 12 forming part of the upper frame 35 (see Figs. 10 and 11) by means of bolts 11. The supports 12 can slide upon a frame 13 and be fixed to it by means of bolts 14. The supports 12 are caused to move to and fro by means of hand wheels 15 and screws 16 and are held up against the screws by springs 17. In this manner the positioning of the segment 6 with respect to the surface of the roller 1 may be easily effected with great precision and thus the machine can be worked under the best conditions.

The rear of the segment 6 is hollow, as is also the corresponding surface of the carrier 8, a space 18 being thus formed in which water is caused to circulate, cocks 19 and 20 being provided; this circulation of water is for the purpose of maintaining all the working parts of the segment at the same temperature, suitable packing interposed between the two parts prevents leakage.

The apparatus in which the last operations of rolling out and of conversion into flour, are performed, are moreover provided with an arrangement for preventing the approach and contact of the segment 6 with the roller, when the apparatus rotates with no meal in it. This arrangement shown in the drawing, consists of tie rods 21 fixed to the supports 12 and carried by the uprights 22 which support the hopper. These tie rods are surrounded, between the supports 12 and the uprights 22, by telescopic pieces

23. Approximate regulation is first effected by positioning the segment carrier and the supports, these parts being then fixed by nuts, after which the rods and tie pieces are successively adjusted by means of nuts carried by them in order to perfect the regulation of the distance of the segment from the roller. In place of this arrangement, the supports 12 and 22 may be connected together in such a manner as to form an arch which may bear upon the front and rear of the framing. This arch is then provided with the same positioning arrangements as was indicated for the operation of splitting the grain and the first rolling operation, that is to say, the bolts 11, screw 16 and the hand wheels 15, with return springs 17.

The grain is delivered to the apparatus by the arrangement shown diagrammatically, viz: by a hopper 24 and two rollers 25. The grain passes between the fixed segment 6 and the roller 1, which is put in motion by gearing driven by fixed and idle pulleys 26 and 27. When at work, the surface of the cylinder is constantly cleaned by a circular brush 28 driven from the shaft, the periphery of the brush being provided with bristles 29, placed at suitable intervals apart, in order to avoid clogging. The brush shaft is carried by two eccentric supports 30, fixed to the framing, thus allowing the brush to be brought nearer to or farther from the roller.

The grain before its passage into the mill, is shown in Fig. 4. The effect of the passage through the first phase or mill is to split the grain as shown in Fig. 5. It now has its two lobes 31 opened out and connected together hingewise by a portion 32 of the envelop. The germ is also separated in this operation. The impurities contained in the furrow of the grain are partially separated from it during this passage and partly by a first bolting. In this splitting operation, the grain falls on the cylinder 1 on which, owing to its shape and that of the grooves on the cylinder, it takes up a longitudinal position in the grooves either naturally and usually as it reaches the cylinder, or when it already engages under the segment. In the latter case, the grain, placed transversely on the groove presents itself with one end between the rounded top of the ridge between the grooves, and the inclined surface of the segment, and as that end does not meet with sufficient adherence on its two contact surfaces, it is pushed back relatively to the cylinder, and the grain places itself lengthwise in the next groove. In this groove the grain is thereby forced to place itself longitudinally, whereby the opening up of the same along the furrow is assured.

The passage of the grain through the subsequent phases of the machine effects the rolling out of the split grain, the results are



shown in Figs. 6 to 8. It must be remembered that the envelop 33 remains whole, and that the semolina 34 is detached during such passages or during intermediate bolt-

5 ings, and finally as shown in Fig. 8 the envelops 33 freed from starch and gluten are obtained without the detachment of particles of bran which do not therefore mix with the semolina, dust or the flour.

10 In the last series of phases of the passage through the apparatus which correspond to the conversion into flour, all the coarse red semolina derived from the preceding pas-

15 sages either mixed together or taken separately according to grade is first treated. Then the dust obtained, added to that obtained in the preceding passages or taken separately according to grade, is converted into flour.

20 In all this series of operations, it will be observed, the widths of the grooves is less than that of the grain and, therefore, the grain is rolled over by the rounded ridges whereby the comminuted products are pro-

25 duced by a rolling or "pulling off" operation.

It will be seen from these operations that it may be desirable to add to the mill herein described any suitable arrangement for

30 feeding or delivering the grain or products operated upon, also covers or casings of suitable shape for preventing the escape of flour or dust.

#### Claims—

35 1. The method of comminuting cereals, which consists in first splitting the cereal grains along the furrow and then flattening out the opened grains and exerting a progressively increasing pressure on the

40 same, said pressure varying at the different portions of the same.

2. The method of comminuting cereals, which consists in first splitting the cereal grains along the furrow and then suc-

45 cessively flattening out the opened grains, exerting a progressively increasing pressure on the same, said pressure varying at different portions of the same to extract the dust, and finally to convert the dust and semo-

50 lina into flour.

3. In a mill, the combination of a roller provided in its surface with grooves extending parallel to its axis and having rounded ridges interposed between the

55 grooves, a segment having a smooth face the working portion of which is arranged concentric with the roller, and means for feeding grain between the roller and the segment.

60 4. In a mill, the combination with a roller provided on its surface with grooves extending parallel to the axis and having rounded ridges interposed between them, of a smooth-faced segment having a lower por-

65 tion of its face concentric with and the

upper portion eccentric to the roller, and means to feed grain between the segment and the roller.

5. In a mill, the combination of a roller provided with grooves extending parallel to 70 its axis, a hollow segment having a smooth face, the working portion of which is arranged concentric with the roller, a hollow carrier to which the segment is secured and forming a chamber, and circulating pipes 75 leading into and out of the chamber formed by the segment and the carrier.

6. In a mill, a roller provided at its periphery with grooves parallel to its axis and having rounded edges, in combination 80 with a smooth fixed segment arranged over the same and forming an opening for receiving the grain, said opening narrowing in the direction of feed.

7. In a mill, the combination, with a 85 smooth fixed segment, of a roller cooperating therewith and provided in its surface with grooves extending parallel to its axis and arranged with rounded ridges interposed between the grooves, means for sup-

90 plying grain to the grooves, and means for adjustably positioning the segment about its own axis.

8. In a mill, the combination, with a car- 95 rier, and a smooth fixed segment adjustably mounted thereon, of a roller cooperating therewith and provided in its surface with grooves extending parallel to its axis and arranged with rounded ridges interposed between the grooves, means for supplying 100 grain to the grooves, and means for securing and maintaining a predetermined relation between the positions of the segment carrier and roller independently of the ma-

105 terial operated upon.

9. In a mill, the combination, with a smooth fixed segment having a concave face, of a roller cooperating therewith and pro- 110 vided in its surface with grooves extending parallel to its axis arranged with rounded ridges interposed between the grooves, means for supplying grain to the grooves, and means for adjustably supporting the seg- 115 ment at an inclination to the grooved surface of the roller.

10. In a mill, the combination, with a smooth fixed segment, of a roller cooperating therewith, a support for the roller, a carrier for the segment slidably mounted on the support, a screw spindle journaled in the 120 support and bearing on one end of the carrier, means for rotating the spindle to advance the carrier, and a spring bearing on the opposite end of the carrier to retract the same. 125

11. In a mill, the combination, with a smooth fixed segment, of a roller cooperating therewith, a support for the roller, a carrier for the segment in the form of an 130 arm mounted on the support, a tie rod con-



necting the free end of the segment arm with a suitable support, and means to exert tension through the tie rod on the segment arm to spring the same closer to the roller.

5 12. In a mill, the combination, with a smooth fixed segment, of a roller coöperating therewith, a support for the roller, a carrier for the segment slidably mounted on the support, a screw spindle journaled in the support and bearing on the carrier, means for rotating the spindle to advance the carrier, a spring to retract said carrier, a tie rod connecting the free end of the segment carrier with a suitable support, and means 10 to exert tension through the tie rod upon the segment carrier to spring the same closer to the roller.

13. In a mill, the combination, with a smooth fixed segment, of a roller coöperating therewith, a support for the roller, a carrier arm for the segment slidably mounted on the support, a screw spindle journaled in the support and bearing on the segment carrier, means to rotate the spindle to advance 25 the carrier, a spring to retract the carrier, means to fix the carrier in adjusted position, a second arm arranged opposite the segment carrier arm, a tie rod connecting the two arms, and means to exert tension in the tie rod to spring the arms and the segment 30 closer to the roller.

14. In a mill, a series of members each consisting of a smooth fixed segment in combination with a roller coöperating therewith 35 and provided in its surface with grooves extending parallel to its axis and having rounded ridges interposed between the grooves, the number of grooves per length of circumference increasing progressively 40 for the members of the series, means for supplying grain to the first member in the series, and means for feeding the product of one member to the other members in succession.

45 15. In a mill, a series of members each consisting of a smooth fixed segment in combination with a roller coöperating therewith and provided in its surface with grooves extending parallel to its axis with rounded 50 edges, the grooves of the earlier members of the series being symmetrical in cross-section

and those in the later members being unsymmetrical, means for supplying grain to the first member in the series, and means for feeding the product of one member to the 55 other members in succession.

16. In a mill, a series of members each consisting of a smooth fixed segment in combination with a roller coöperating therewith 60 and provided in its surface with grooves extending parallel to its axis with rounded edges, the grooves of the earlier members in the series being symmetrical in cross-section and those in the later members being unsymmetrical and the distances between the 65 grooves in the several members of the series decreasing from the earlier to the later, means for supplying grain to the first member in the series, and means for feeding the product of one member to the other mem- 70 bers in succession.

17. In a mill, a series of members each consisting of a smooth fixed segment in combination with a roller coöperating therewith 75 and provided in its surface with grooves extending parallel to its axis with rounded edges, the grooves of the earlier members in the series being symmetrical in cross-section and those of the later members being unsymmetrical and the distances between the 80 grooves in the several members of the series decreasing from the earlier to the later, means for supplying grain to the first member in the series, means for feeding the product of one member to the other members in 85 succession, and means for adjustably supporting the several segments at an inclination to their respective coöperating rollers, and means for maintaining the relative positions of the segment and roller of the last 90 member in the series independently of the material operated upon.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

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