

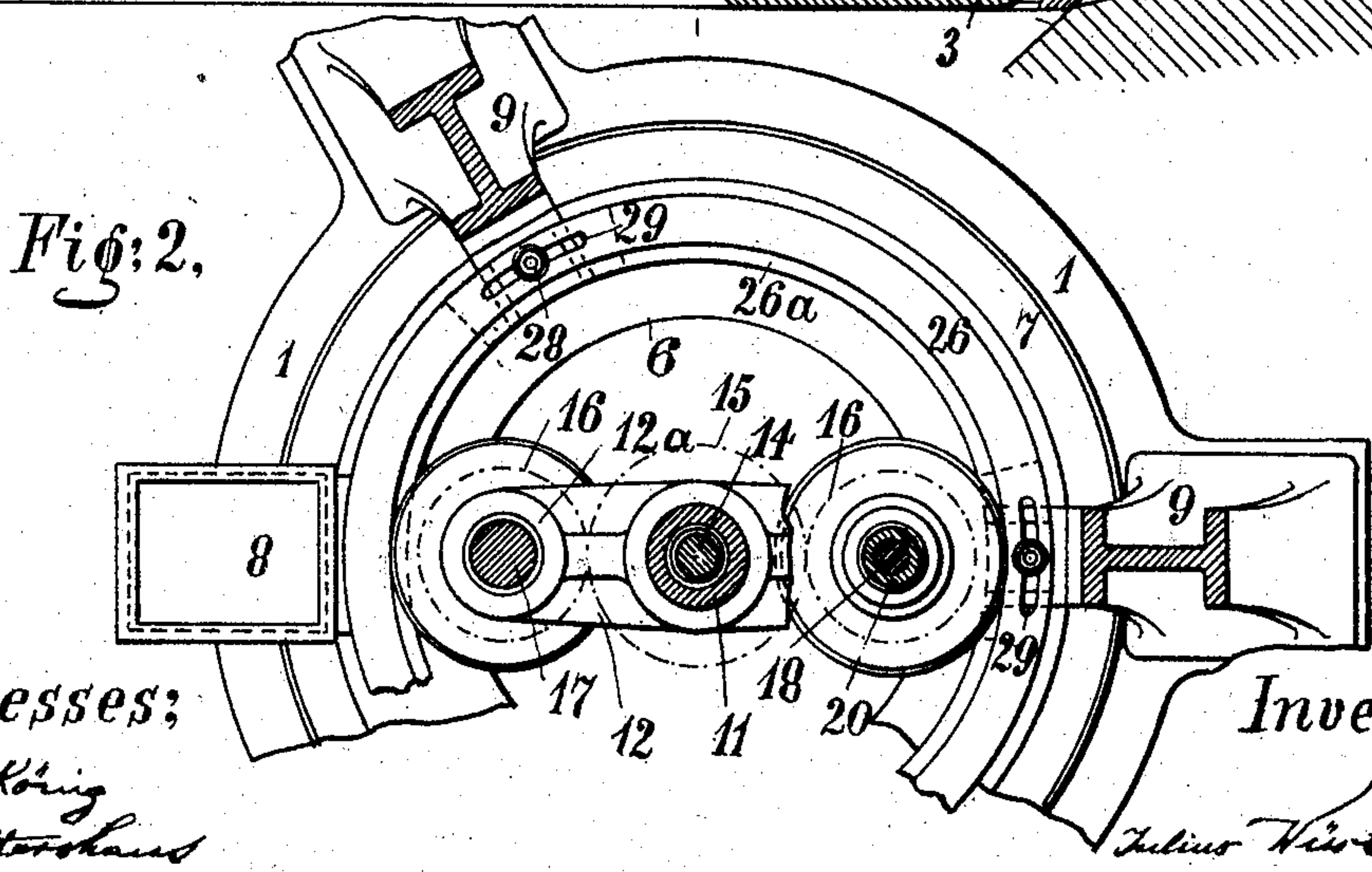
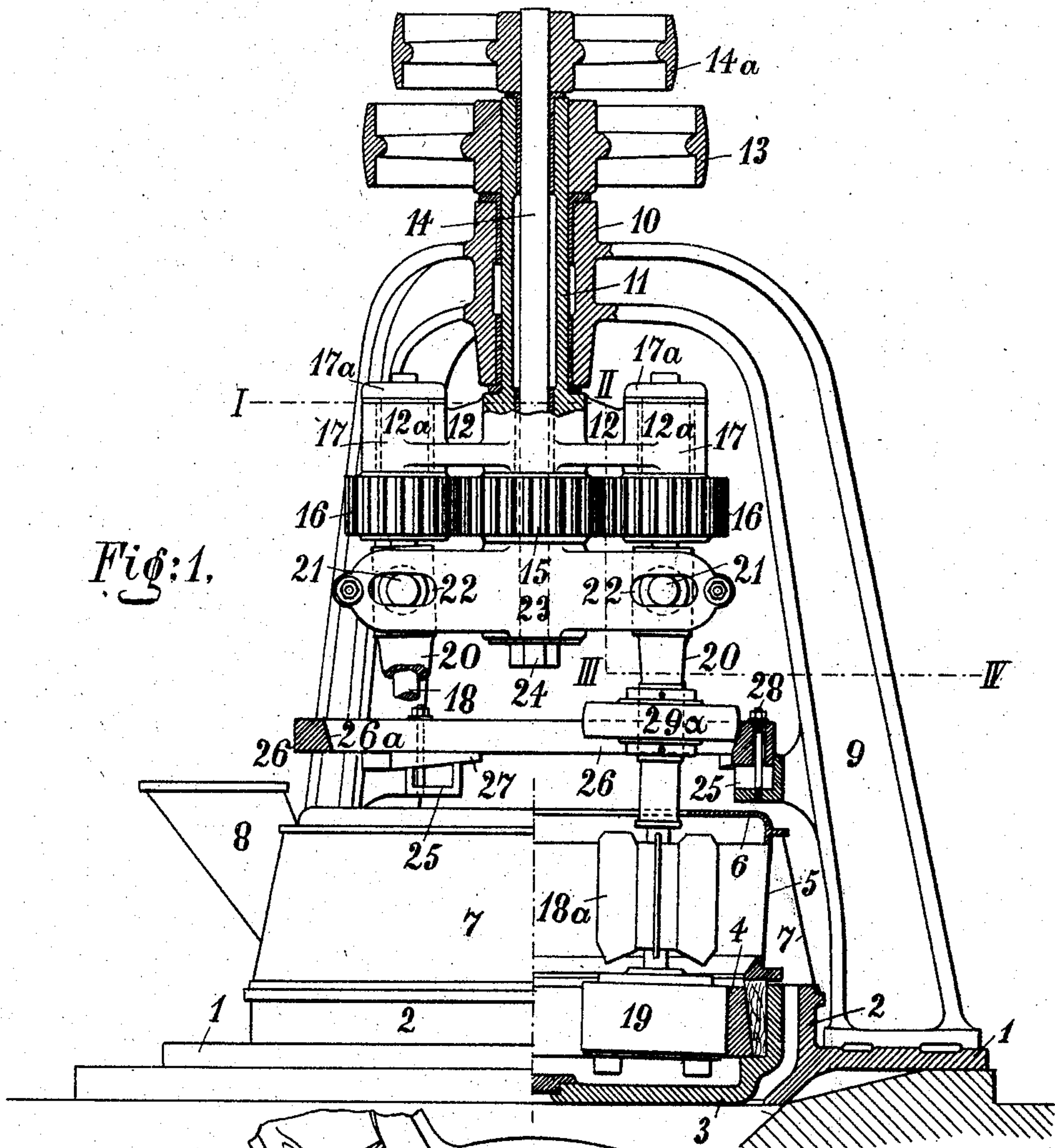
No. 787,018.

PATENTED APR. 11, 1905.

J. WÜSTENHÖFER.  
PENDULUM MILL

APPLICATION FILED NOV. 28, 1902.

2 SHEETS—SHEET 1.



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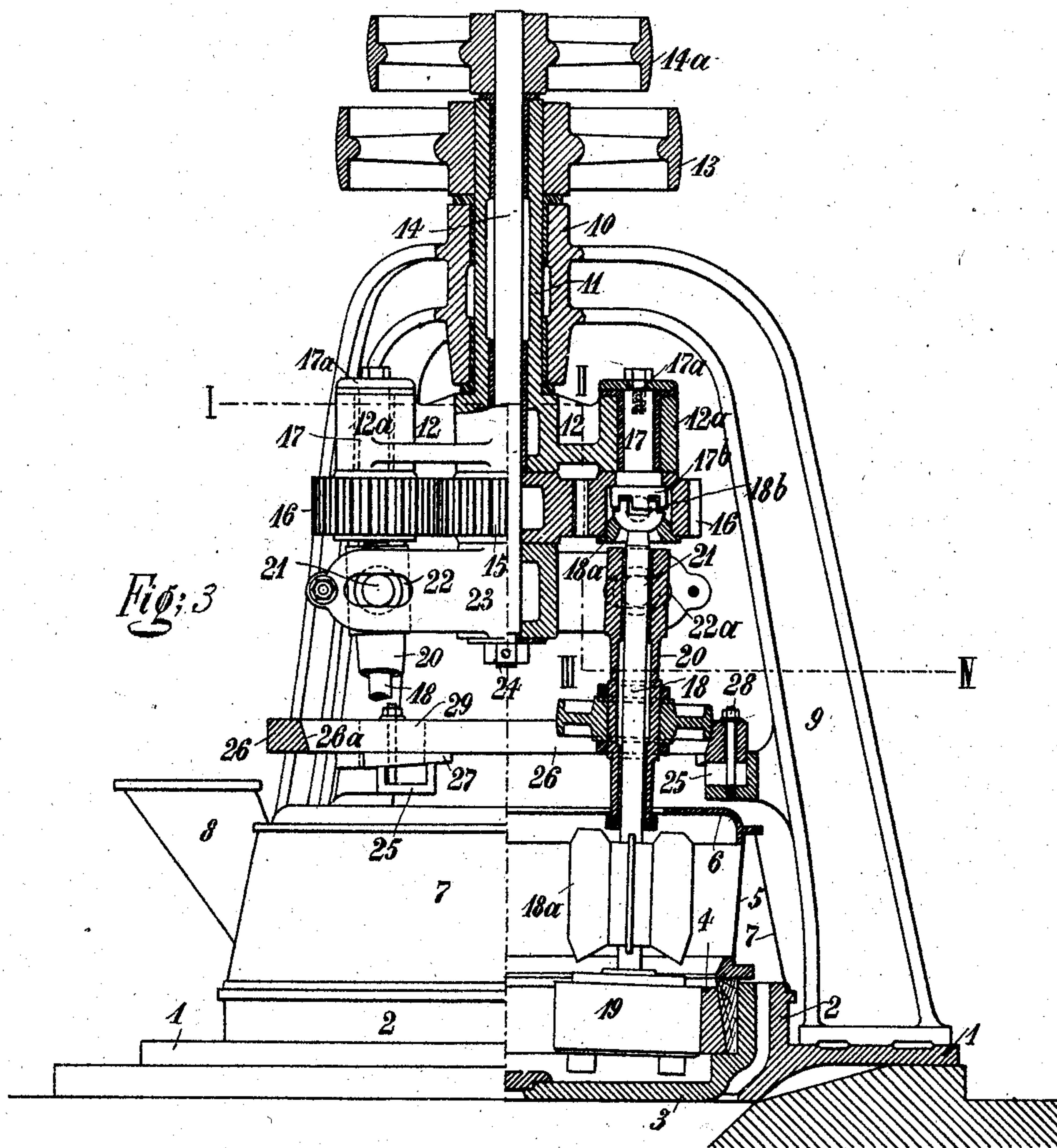
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# UNITED STATES PATENT OFFICE.

JULIUS WÜSTENHÖFER, OF DORTMUND, GERMANY.

## PENDULUM-MILL.

SPECIFICATION forming part of Letters Patent No. 787,018, dated April 11, 1905.

Application filed November 28, 1902. Serial No. 133,095.

*To all whom it may concern:*

Be it known that I, JULIUS WÜSTENHÖFER, a subject of the Emperor of Germany, residing at Dortmund, in the Province of Westphalia, Germany, have invented certain new and useful Improvements in Pendulum-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in pendulum-mills for grinding hard materials; and it has for its object to increase the efficiency of these mills by giving the grinding roller or rollers a positive motion, so that its or their rotation round its or their own axis or axes is not depended upon for the circular travel of the grinding-roller along the inner circumference of the mill-ring only, but that it may be accelerated or retarded or even contrary in direction to that which it will naturally take by the rolling of the grinding-roller along the mill-ring. This is attained by driving the grinding-roller spindles direct by some suitable gear and by causing the circulating motion of the grinding-rollers along the mill-ring also to be carried out under the influence of a special driving-gear.

A further object which I have in view with my invention is to enable the mill to grind the materials down to fine dust or flour, as well as to reduce the same to a certain degree of comminution only.

These objects may be attained by various modes of construction for carrying out the inventive idea laid down above and the gist of which is to give a positive motion to the grinding-roller both for its rolling or circulating along the mill-ring, as well as for its rotation round its own geometrical axis, and to arrange it so that its circumference may touch the inner circumference of the mill-ring or that it may be held off from the latter more or less, as may be desired.

On the accompanying drawings I show one example of carrying out my idea.

Figure 1 is a vertical view, partly seen in a vertical central section. Fig. 2 is a horizontal section along the broken line I II III IV

of Fig. 1. Fig. 3 represents a view similar to Fig. 1, but with a greater part of the machine sectioned.

On a bed-plate 1 is placed within a raised ring or flange 2 the mill-tub 3, which is armed by the hardened mill-ring 4, held therein in well-known manner. The mill tub or pan 3 is surmounted by a casing 5, of perforated plates, so as to form a sieve, and a cover 6 is placed on the top of said sieve. This sieve 5 is surrounded by a casing 7, of solid plates, so as to prevent dust from entering into the surrounding rooms. A hopper 8 serves for feeding the material to be ground into the mill-tub. On the bed-plate 1 are based the standards 9, which on the top are united in a hub or boss 10 for carrying the driving-gear of the machine. So far the machine does not present any materially new features. In the bore of the bushed hub 10, however, there is placed a hollow shaft 11, which below the hub has cast to it or otherwise fixed thereto two diametrical arms 12 with heads 12<sup>a</sup>, and above said hub is keyed to the hollow shaft a driving-pulley 13, resting with the lower face of its boss upon the upper face of the hub 10, and thus supporting the hollow shaft on the standards 9.

Inside of the hollow shaft 11 is placed and guided by brasses a solid shaft 14, to which is keyed at its upper end a driving-pulley 14<sup>a</sup>, bearing with the lower face of its boss upon the upper face of the hollow shaft 11, thereby holding the solid shaft in place vertically. Below the arms 12 12<sup>a</sup> of the hollow shaft 11 there is keyed to the solid shaft 14 a spur-wheel 15, which is in gear with the wheels 16 on the short shafts 17, which are held in the heads 12<sup>a</sup> of the arms 12 so that they can rotate therein, collars 17<sup>a</sup> holding them in place vertically. In the center of the wheels 16 there are coupled to the shafts 17 by a ball-and-socket joint of suitable design, so that they can swing out in any direction, the pendulum-shafts 18 of the grinding-rollers 19. These shafts are surrounded each by a socket 20, which, by means of arms 21, projecting horizontally right and left, are guided in slots 22 of a cross-head 23, held rotatively on the solid shaft 14. A broad nut



and washer 24 holds this cross-head in place vertically.

As will be seen from Fig. 3, the head 12<sup>a</sup> of the arm 12 is bushed out, and it contains the short vertical shaft 17, which is guided therein and so held by a screw and washer 17<sup>a</sup> that it can rotate therein. Its lower end is somewhat enlarged and reaches into the bore of the spur-wheel 16, which is connected thereto rigidly. Here the shaft 17 is coupled to the upper end of the shaft 18 by means of a universal ball-joint 17<sup>b</sup> 18<sup>b</sup>. This part 18<sup>b</sup>, which is of hemispherical shape and forming the upper end of said shaft 18, is held in the bore of the spur-wheel 16 by a gland 18<sup>a</sup>, which is screwed into said bore from below and forms a ball-bearing for the head 18<sup>b</sup>, thus allowing the shaft 18 free movement in any direction. Below the gland 18<sup>a</sup> the shaft 18 passes through and is guided in the socket or sleeve 20. This sleeve passes through a forked opening or a vertical slot 22<sup>a</sup> in the cross-head 23, and by the arms or pins 21, projecting sidewardly from it, it is guided in the horizontal slots 22 in the cross-head 23, so that it and the mill-roller 19 can move radially as desired without the roller-shaft 18 being hindered in its rotation.

From the description given so far and from the drawings it will now be understood that when the pulley 13 is driven round from any suitable source of power and in the same way the spur-wheel 15 is also turned the hollow shaft 11 will take round with its arms 12 12<sup>a</sup> the roller-shafts 18 with the boxes 20, so that the grinding-rollers 19 will roll along the inner circumference of the mill-ring 4. At the same time the spur-wheels 16 engaging with the spur-wheel 15 roll along this wheel and are thereby turned round their own axes, and thus cause the roller-shafts 18, to which they are keyed, to be turned round. Since, however, the solid spindle 14, to which the spur-wheel 15 is keyed, receives its own motion by the pulley 14<sup>a</sup>, the wheels 16 and the roller-shafts are at the same time driven positively, and it will be easily understood that by changing the diameters of the pulleys 13 14<sup>a</sup> or their speed and the direction in which they are turned the working action of the grinding-roller can be varied at will, its relative movement with regard to the mill-ring 4 can be accelerated or retarded, it can be so that the grinding-roller slides upon the mill-ring either because it runs too fast or because it is dragged upon the mill-ring, and it can even be turned in a contrary direction to that which it naturally would take by its circulating motion along the mill-ring 4.

Attention may still be called to the wings 18<sup>a</sup>, placed on the shafts 18 above the grinding-rollers and working like a fan for driving out the fine dust through the sieve 5. By this means the action of the grinding-roller can be arranged as best suited to the nature of

the material to be ground, and it will thus be understood that a mill working always under such favorable circumstances will in all cases render a maximum of efficiency.

Now it may be desirable that the mill shall not grind the material under treatment down to dust or fine powder or flour, but that only granulation or the formation of corn or grain of certain size is required, and this can be very easily attained by the following arrangement: The pedestals 9 are provided with inwardly-projecting brackets 25. The upper sides or edges of these brackets are oblique or slanting in circumferential direction. Their object is to take up and to carry a ring 26, having an inner conical or oblique side 26<sup>a</sup>, while at its bottom side it is provided with three wedge-shaped feet 27, corresponding to the three brackets 25 on pedestals 9, two of which are only shown in the drawings. With these feet the ring 26 rests upon the brackets 25, and it is held firmly down upon them by bolts and nuts 28, slots 29 in the ring allowing it to be turned round a certain extent upon the brackets, and it will easily be understood that when the ring is turned either to the right or to the left it will be raised or lowered on account of the oblique bearing-surfaces of the brackets 25 and the wedge-shaped feet 27, respectively. Now in the level of the conical side 26<sup>a</sup> of the ring 26 there is fitted to each box 20, incasing the grinding-roller shaft, a distance-roller 29<sup>a</sup>, which can freely rotate thereon and which bears against the oblique circumference 26<sup>a</sup> of the ring 26, and thus hinders the grinding-roller to approach the mill-ring more than is desired or keeps the grinding-roller at such distance—it may be zero—as will correspond to the size of corn or grain desired to produce.

What I claim, and desire to secure by Letters Patent, is—

1. In a pendulum-mill, the combination of a mill-ring with grinding-rollers, a pair of concentric shafts, arms carried by one of said shafts, the intermediately-jointed rotary shafts of the said rollers carried by the said arms, gearing between the said shafts of the rollers and the other concentric shaft for rotating the said roller-shafts individually, as they are carried around by the said arms and means for rotating the shaft provided with the said arms substantially as set forth.

2. In a pendulum-mill, the combination of a mill-ring with grinding-rollers, a pair of concentric shafts, means for independently rotating the said shafts, a gear-wheel on the inner shaft, arms carried around by the outer shaft, grinding-roller shafts supported by the said arms and free to turn on their axes and gear-wheels, carried by the said roller-shafts, which wheels engage the said gear-wheel on the inner shaft substantially as set forth.

3. In a pendulum-mill, the combination of a mill-ring with grinding-rollers, a pair of concentric shafts, means for rotating the said



shafts, a gear-wheel on the inner shaft, arms carried around by the outer shaft, grinding-roller shafts supported by the said arms, free to turn on their axes and intermediately joint-  
5 ed, and gear-wheels carried by the said roller-shafts, which wheels engage the said gear-wheel on the inner shaft substantially as set forth.

4. In a pendulum-mill, two concentric ro-  
o tary shafts and intermediately-jointed rotary shafts carried by arms of one of said concentric shafts and bearing on their lower ends

grinding-rollers, in combination with the mill-ring of a tub or pan and distance-rollers 29<sup>a</sup> on the said intermediately-jointed rotary 15 shafts in order to regulate the degree of comminution of the material to be ground substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

JULIUS WÜSTENHÖFER.

Witnesses:

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J. A. RITTERSHAUS.