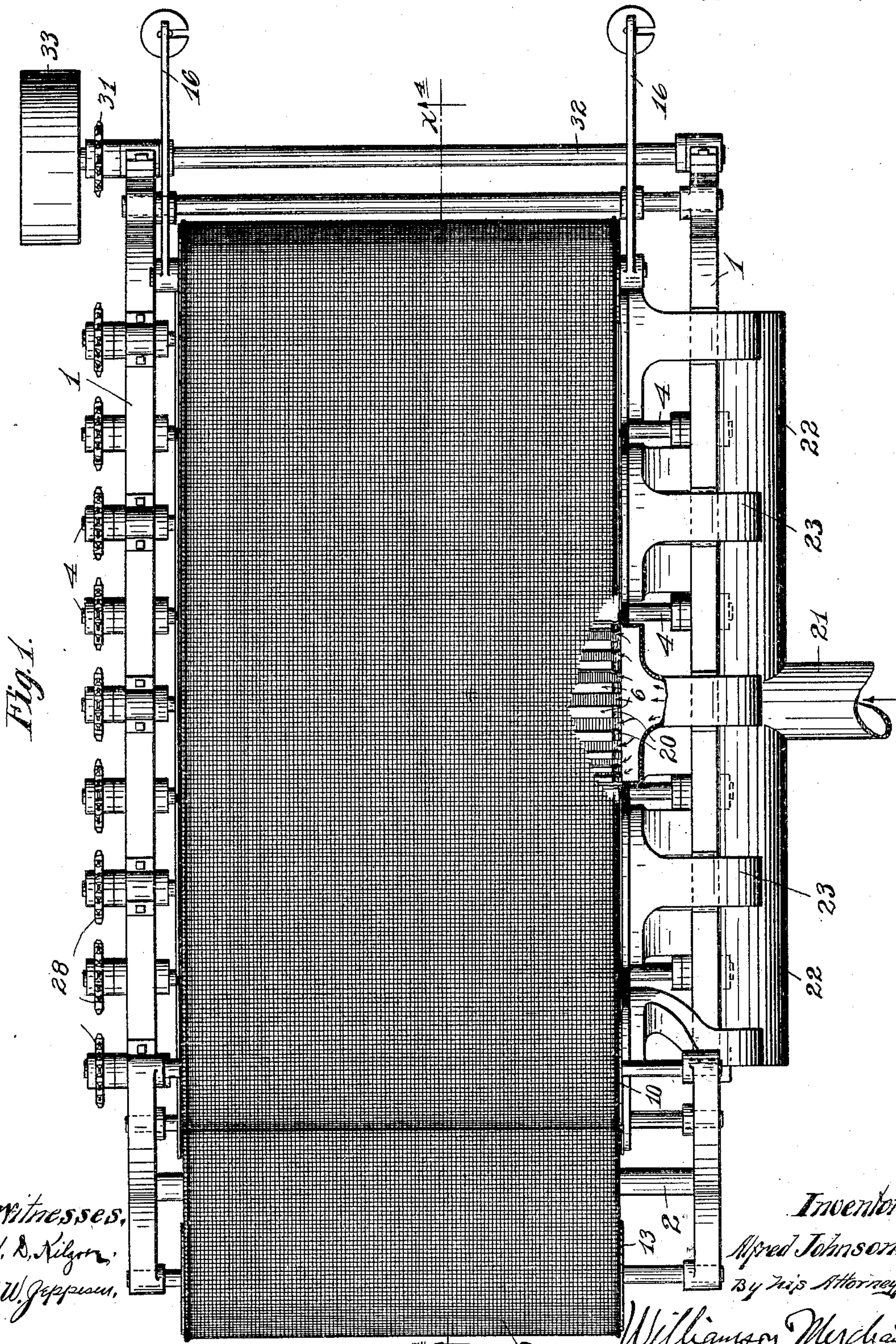


No. 791,029.

PATENTED MAY 30, 1905.

A. JOHNSON.  
GRAIN DRYING MACHINE.  
APPLICATION FILED JUNE 24, 1904.

5 SHEETS—SHEET 1.



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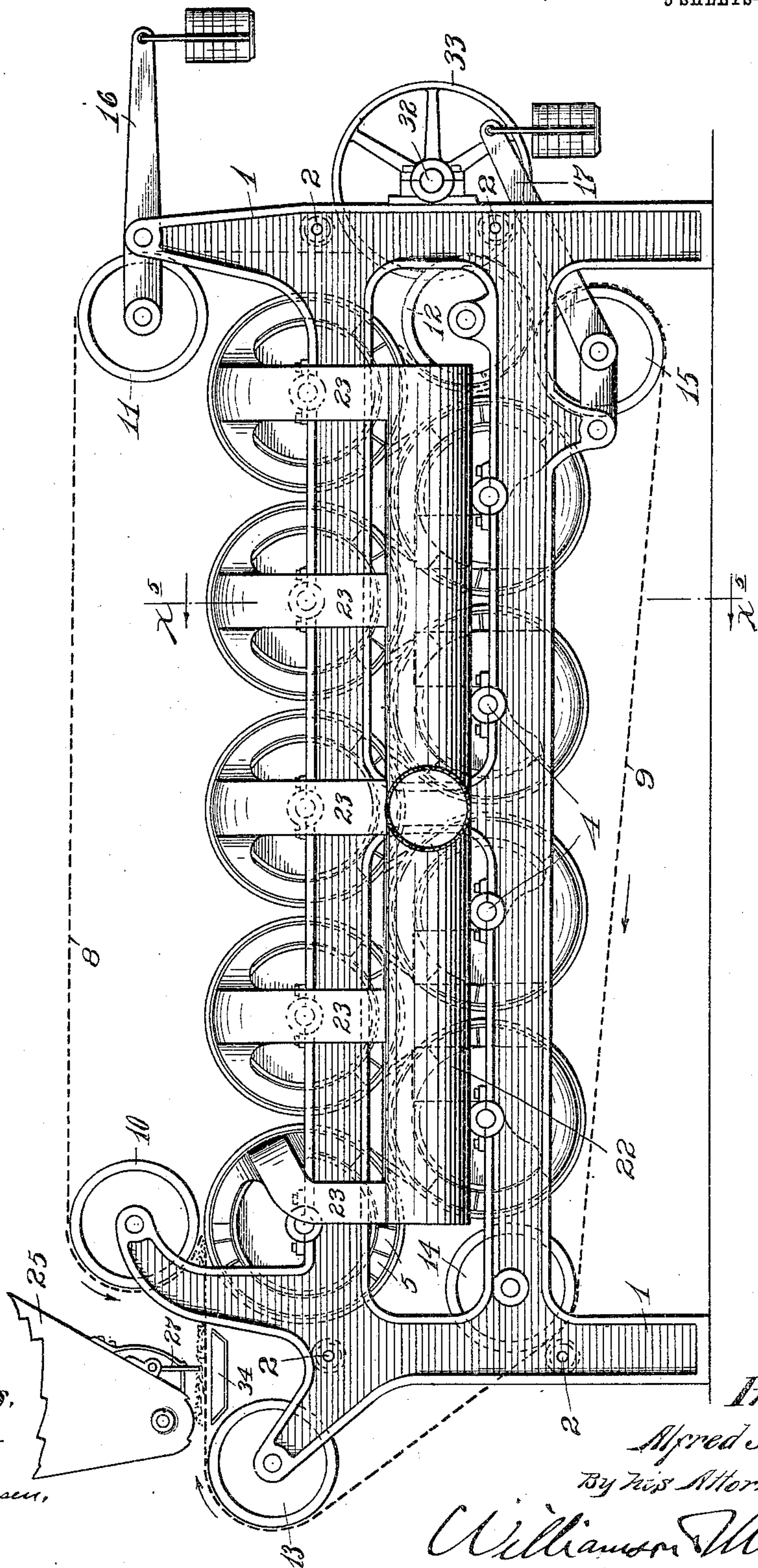
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5 SHEETS—SHEET 2.

Fig. 2.



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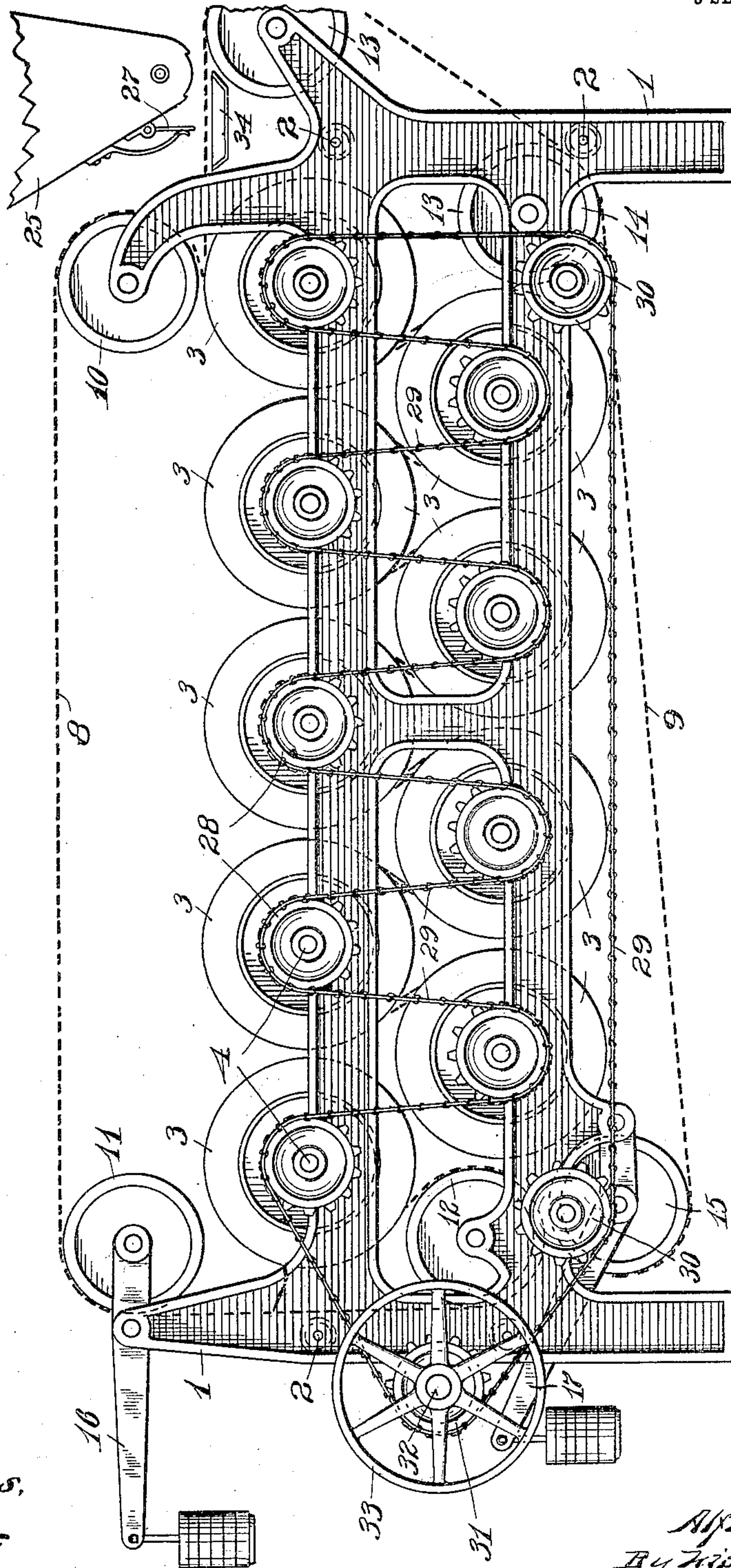
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5 SHEETS—SHEET 3.

Fig. 3.



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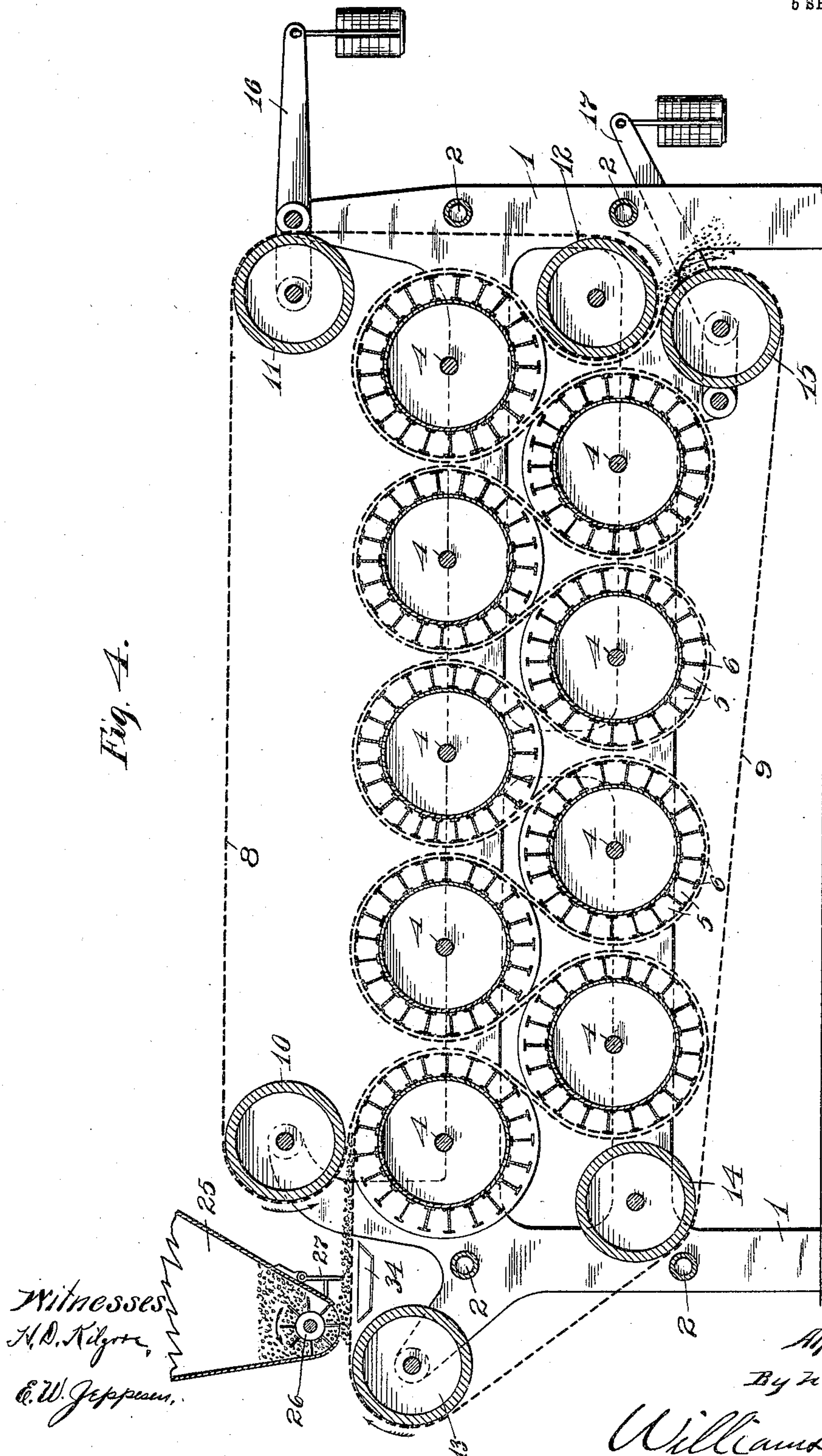
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5 SHEETS—SHEET 4.

Fig. 4.



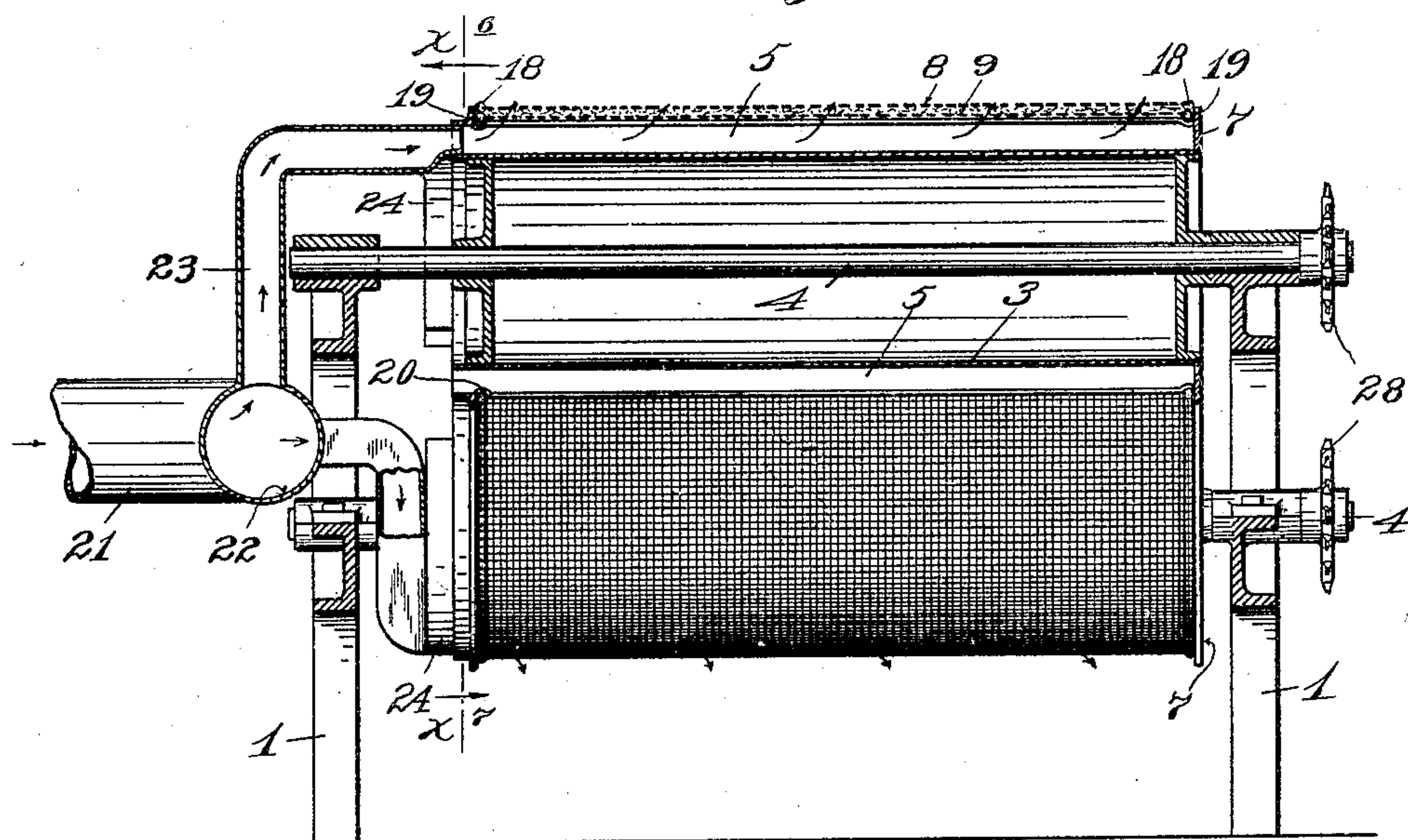
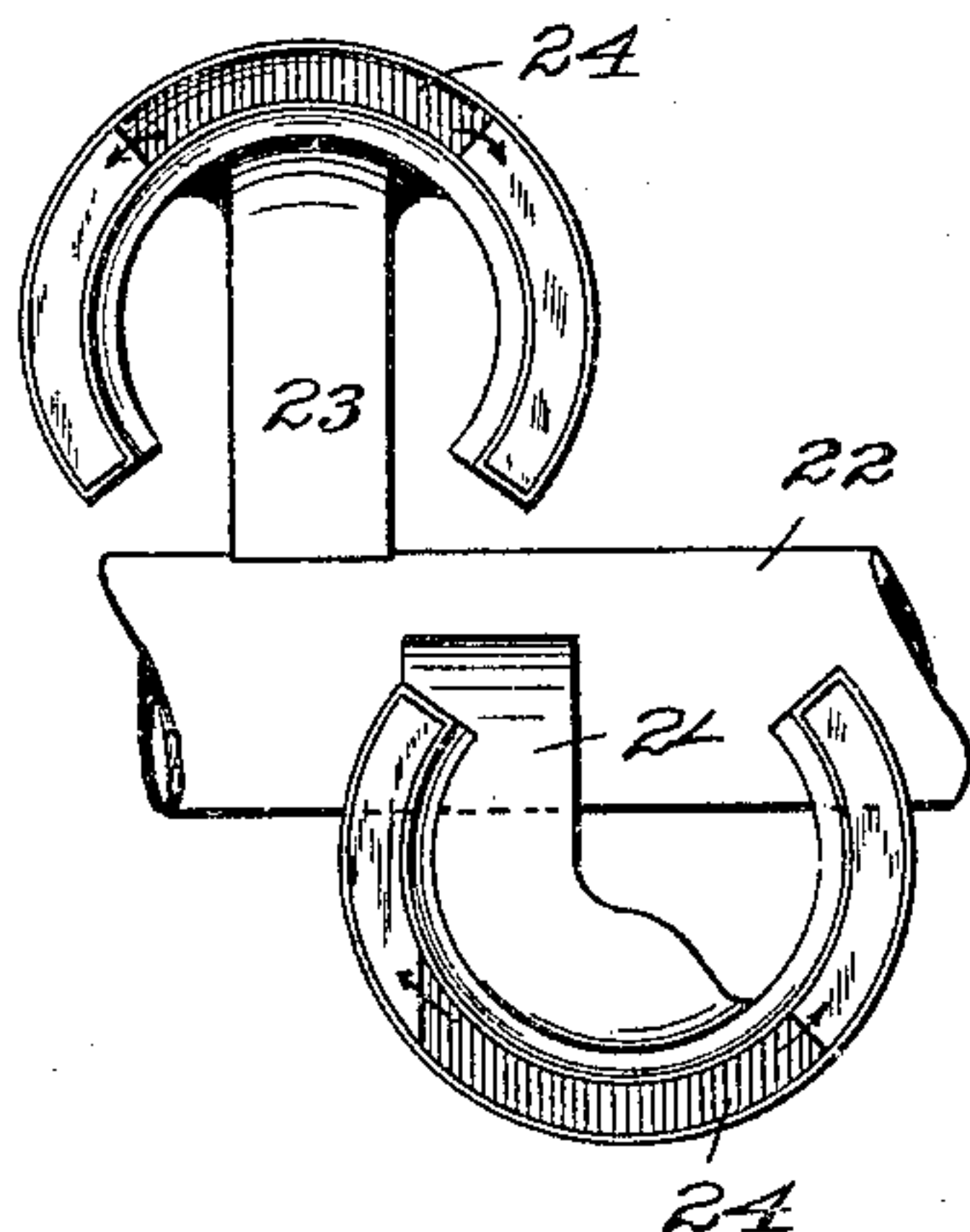
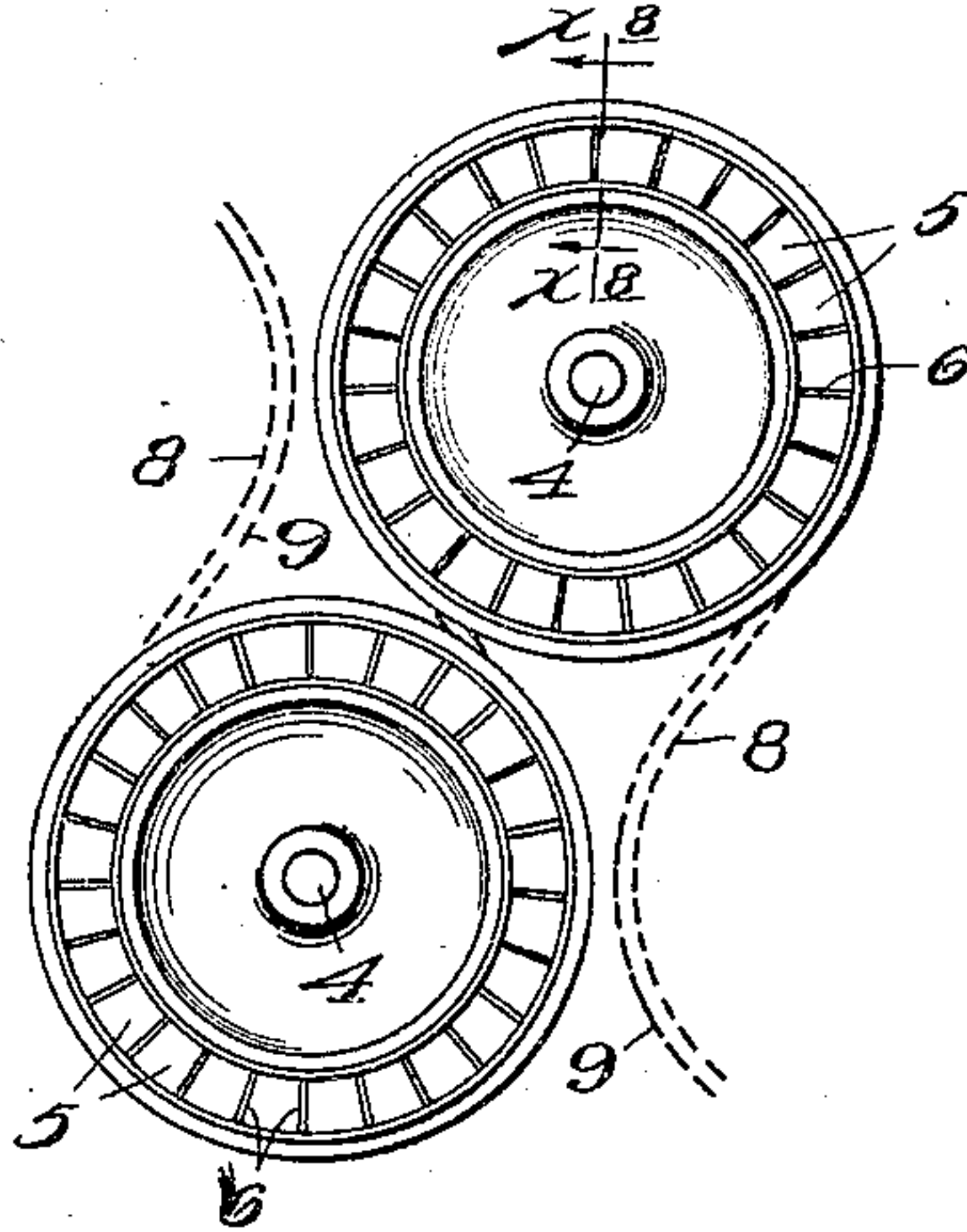
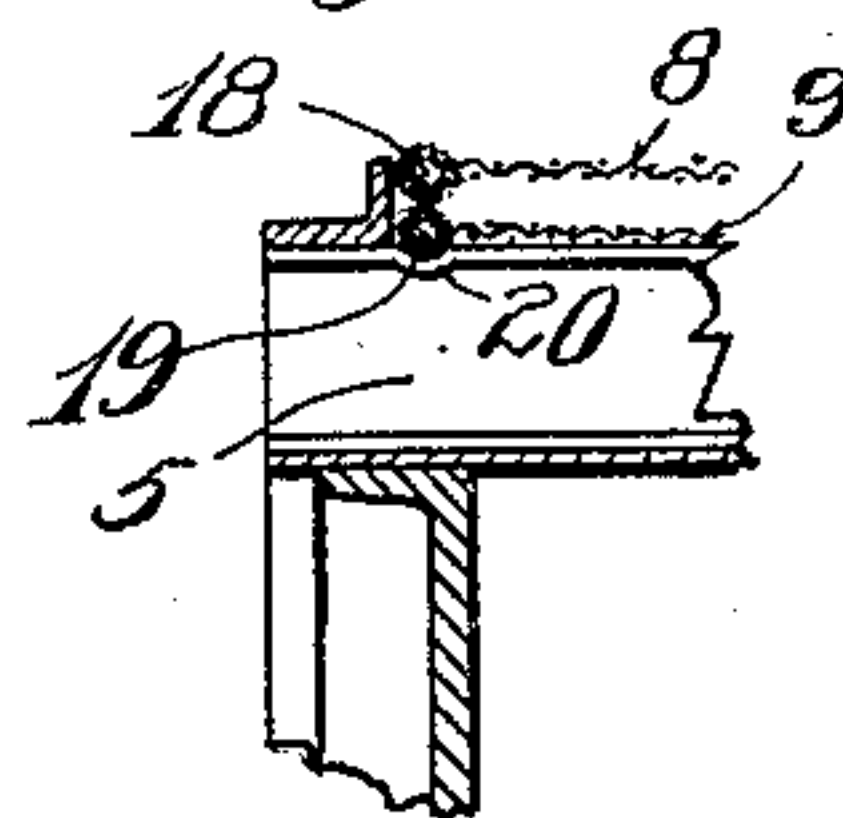
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5 SHEETS—SHEET 5.

*Fig. 5.**Fig. 6.**Fig. 7.**Fig. 8.*

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## UNITED STATES PATENT OFFICE.

ALFRED JOHNSON, OF MINNEAPOLIS, MINNESOTA.

## GRAIN-DRYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 791,029, dated May 30, 1905.

Application filed June 24, 1904. Serial No. 213,909.

*To all whom it may concern:*

Be it known that I, ALFRED JOHNSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Grain-Drying Machines; 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.

My invention has for its special object to provide a grain-drier of high efficiency; and to this end it consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a plan view with some parts broken away, showing a grain-drying machine designed in accordance with my invention. Fig. 2 is a right side elevation of the improved drying-machine. Fig. 3 is a left side elevation of the said machine. Fig. 4 is a vertical section taken through the machine on the line  $x^4 x^4$  of Fig. 1. Fig. 5 is a transverse vertical section taken through the machine approximately on the line  $x^5 x^5$  of Fig. 2. Figs. 6 and 7 are detail views of certain of the parts shown in Fig. 5, the said parts being separated approximately on the line  $x^6 x^7$  of Fig. 5, Fig. 6 being shown as turned toward the left, and Fig. 7 is turned toward the right; and Fig. 8 is a detail in section on the line  $x^8 x^8$  of Fig. 7, some parts being broken away.

The numeral 1 indicates a pair of heavy laterally-spaced side frames, which, as shown, are rigidly tied together by transverse tie-bars 2. In this machine a plurality of rotary drums are mounted in zigzag arrangement, and a pair of endless perforate aprons, preferably of woven-wire screen of fine mesh, are passed over the several drums and by the said drums are caused to take a winding course, with the drum-engaging portions of the opposing aprons slightly spaced apart in parallel lines to afford a channel for carrying a thin sheet of grain. The said drums 3 have shafts 4, that are journaled in suitable bear-

ings on the side frames 1, and each drum on its periphery carries a plurality of longitudinally-extended channels 5, which, as shown, are formed by longitudinally-extended I-beams 6, rigidly secured to said drums. The I-beams 6 are so spaced as to leave narrow transversely-extended openings between their outer portions, as best shown in Figs. 1 and 4, and the channels 5 are open at one end, as shown at the left in Fig. 5, and at their other ends are closed by flanges 7 on the adjacent heads of the corresponding drums.

The upper and lower endless perforate or reticulate aprons are indicated, respectively, by the numerals 8 and 9. These two aprons run over the drums 3, as indicated by the heavy dotted lines marked on Fig. 4. The upper apron 8 also runs over idle guide-drums 10 and 11 and under an idle guide-drum 12. The lower apron 9 runs also over an idle guide-drum 13 and under idle guide-drums 14 and 15. The guide-drums 10, 12, 13, and 14 are mounted in fixed bearings on the side frames 1; but the guide-drums 11 and 15 are mounted on the ends of weighted levers 16 and 17, respectively, which levers are pivoted to the side frames 1 and cause the said drums 11 and 15, respectively, to take up the slack of the aprons 8 and 9. At their edges the endless aprons 8 and 9 are attached to flexible cords or ropes 18 and 19, respectively. The cords or ropes 18 19 furnish selvage edges for the respective aprons, and the said cords 18 and 19 run in notches 20, formed in the ends of the beams 6 of alternate drums, and thus keep the aprons stretched out transversely of the machine to their full width.

Hot air is advisably used as a drying medium, and this may be supplied from any suitable source through a pipe 21, having a transversely-extended section 22, which in turn is formed with a plurality of branches 23. Said branches 23, of which there is one for each drum 3, terminate in segmental discharge-nozzles 24, that open into the ends of the channels 5 of the respective drums and follow the said drums circumferentially approximately as far as the said drums are wrapped about or covered by the opposing parallel sections of the aprons 8 and 9. In



virtue of this construction all the channels 5 which are covered by the aprons and by the thin sheet of grain interposed between them will be supplied with a portion of the blast 5 of air, and the air thus supplied to the said channels will find its only escape through the perforations or meshes of the aprons 8 9 and through the sheet of grain held by the said aprons. Under this action the grain will be 10 very quickly and thoroughly dried.

By reference to Fig. 4 it will be noted that the drums 3 are so disposed and the aprons 8 9 are passed over the same in such manner that the sheet of grain contained between the 15 endless perforate aprons will be continuously subjected to the drying blast from the time it passes onto the first drum 3 until the time it passes off from the last of said drums.

The grain or material to be dried may be 20 conveniently supplied from a hopper 25, supported in any suitable way, and preferably provided in its bottom with a feed-roller 26 for producing a graduated feed and provided outward thereof with a gravity-held leveling- 25 board 27.

At one side of the machine the shafts 4 of the drums 3 project and are provided with sprockets 28. An endless sprocket-chain 29 runs over the sprockets 28, as shown in Fig. 30 3, and runs also over idle sprockets 30 and a driving-sprocket 31. The idle sprockets 30 are loosely journaled on the adjacent side frame 1, while the driving-sprocket 31 is carried by a transverse counter-shaft 32, journaled in suitable bearings on the side frames 35 1, and provided with a pulley 33, over which a power-driven belt (not shown) is in practice run to impart motion to the running parts of the machine. The numeral 34 indicates a catch-pan, located below the feed-hopper 25 and supported by any suitable means. (Not shown.) 40

The machine above described is capable of a great many modifications within the scope 45 of my invention, as herein set forth and claimed. While especially intended for use as a grain-drier, it is of course evident that the device may be used for drying a great many other articles, whether in granulated 50 or finely-divided form or in leaf form. It is thought that the device would be extremely efficient for drying tobacco-leaves, for example. Furthermore, the device is well adapted for use in steaming grain or other material. 55 As is obvious, all that is necessary to convert the machine into a steaming device is to deliver

steam instead of hot air through the pipe 21 and thence through the section 22, branches 23, and nozzles 24 into the channels of the several drums 3. 60

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

1. The combination with a plurality of drums, having open peripheries, of a pair of opposing perforate aprons running over said 65 drums, means for delivering the material to be dried between said opposing aprons, and means for directing a blast of air through the peripheral portions of said drums, through the said opposing aprons, and through the 70 sheet of grain contained between the said aprons, substantially as described.

2. The combination with a plurality of rotary drums, in zigzag arrangement, said drums having channeled peripheries, open at one end 75 and outer portions, of a pair of endless perforate aprons running over the said drums, with the drum-engaging portions opposing parallel arrangement, means for delivering the grain between the drum-engaging portions 80 of said aprons, segmental distributing-nozzles opening into the open end of the peripheral channels of said drums, and means for supplying air, under pressure, to the said nozzles, substantially as described. 85

3. The combination with a plurality of positively-driven drums, having open peripheries, of a pair of opposing perforate endless aprons arranged to run a zigzag course over said 90 drums, means for directing a blast of air through the peripheral portions of said drums and through the opposing aprons, and means for delivering the material to be dried between the said aprons, substantially as described. 95

4. The combination with a plurality of drums, each having a plurality of longitudinally-extended peripheral channels, open at one end and at their outer edges, a pair of opposing perforate endless aprons, running a 100 zigzag course over said drums, and means for supplying blasts of air to said drums, involving segmental nozzles communicating with the open ends of the peripheral channels of said drums, substantially as described. 105

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

ALFRED JOHNSON.

Witnesses:

R. C. MABEY,

F. D. MERCHANT.