

Nov. 3, 1925.

1,560,012

J. ANDREWS

METHOD OF AND APPARATUS FOR CLEANING GRAIN

Filed Feb. 26, 1923

5 Sheets-Sheet 1

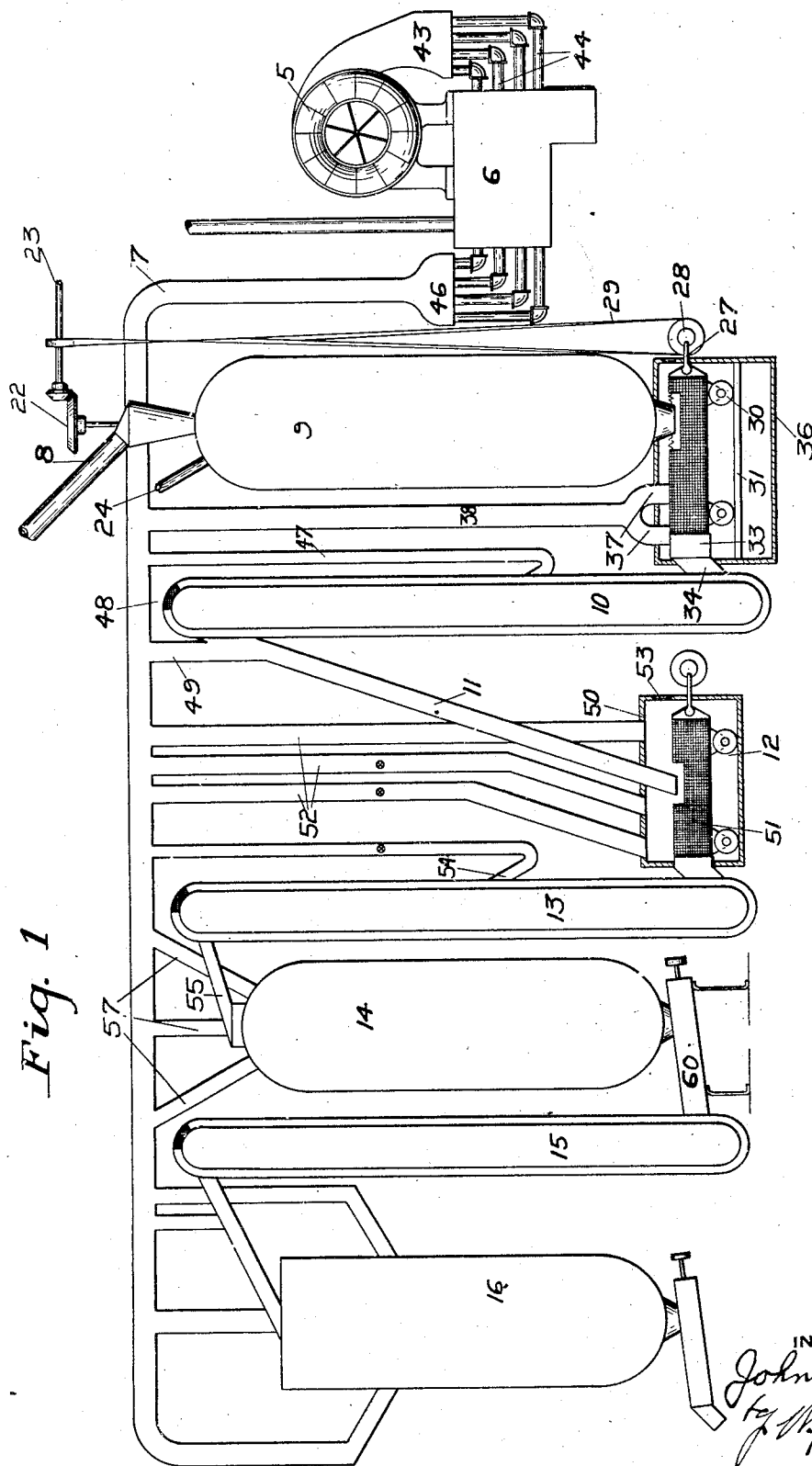


Fig. 1

INVENTOR

John Andrews
by M. H. DeWitt
Attorney.

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5 Sheets-Sheet 2

Fig. 2

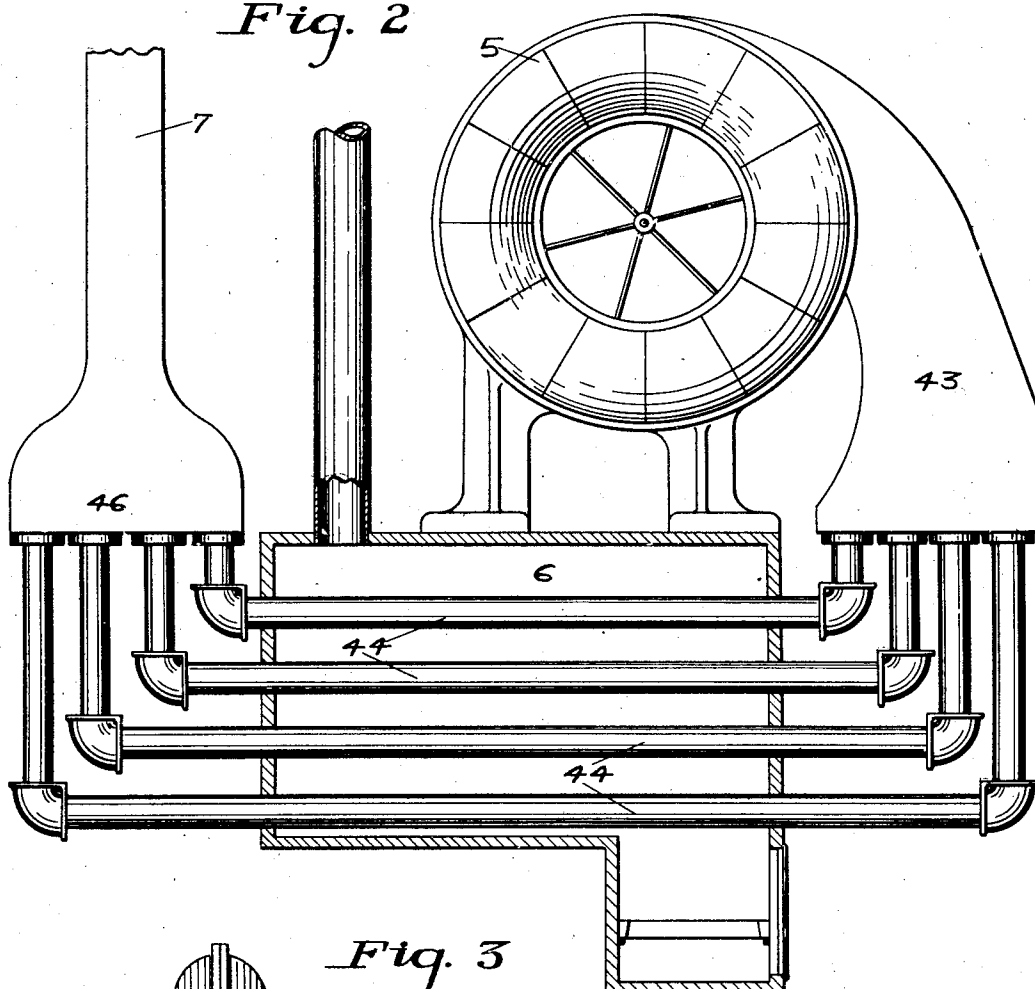
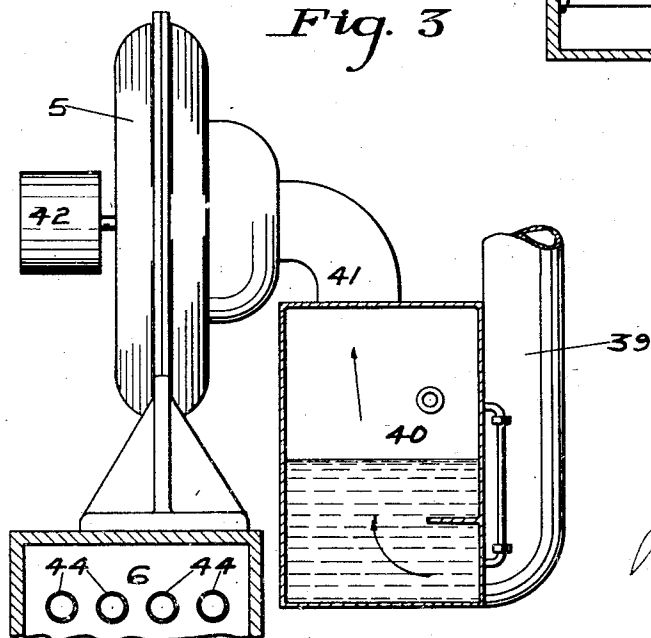


Fig. 3



INVENTOR

John Andrews
by W. F. Doolittle
Attorney.

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Filed Feb. 26, 1923

5 Sheets-Sheet 3

Fig. 4

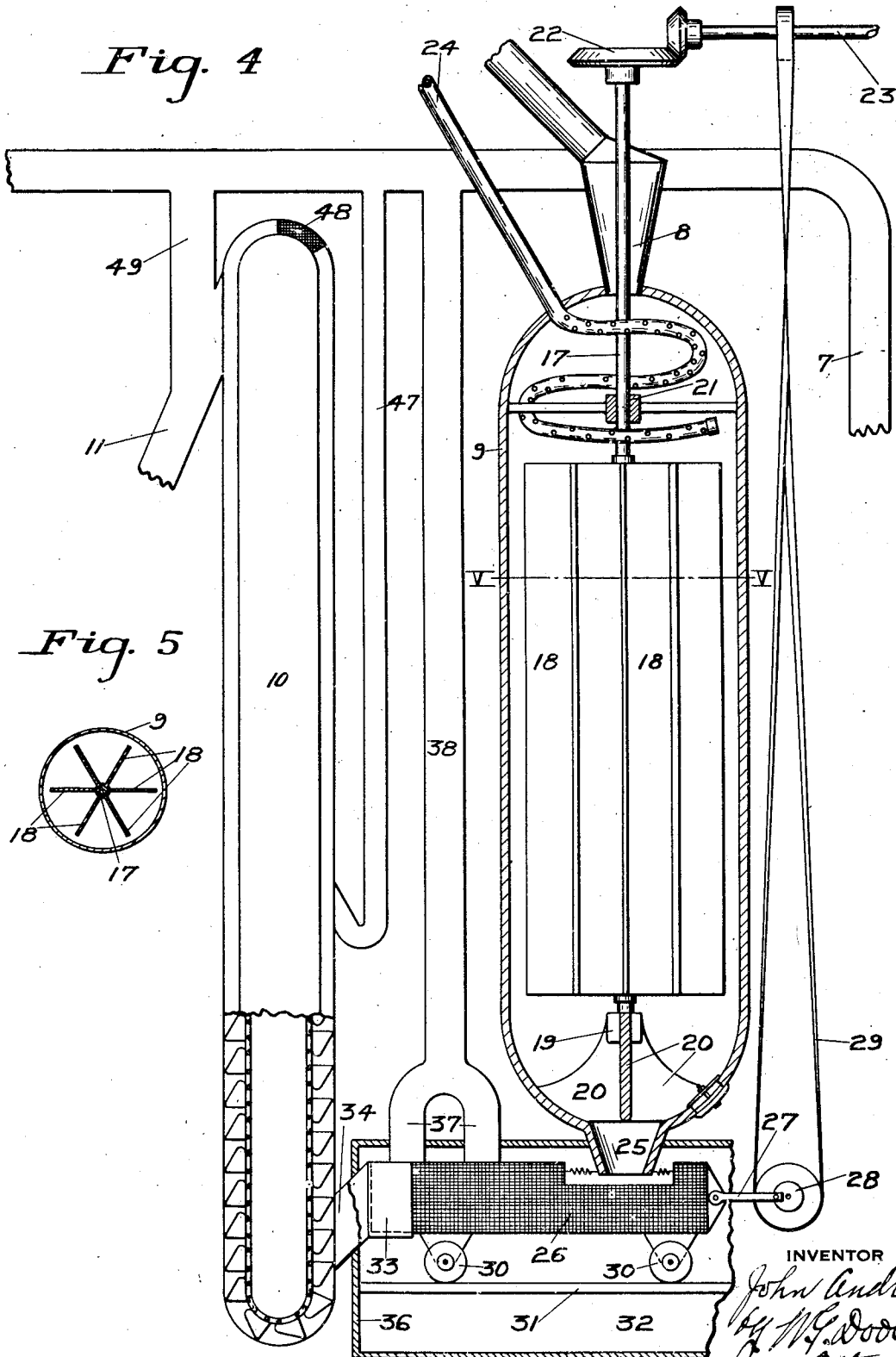


Fig. 5

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J. ANDREWS

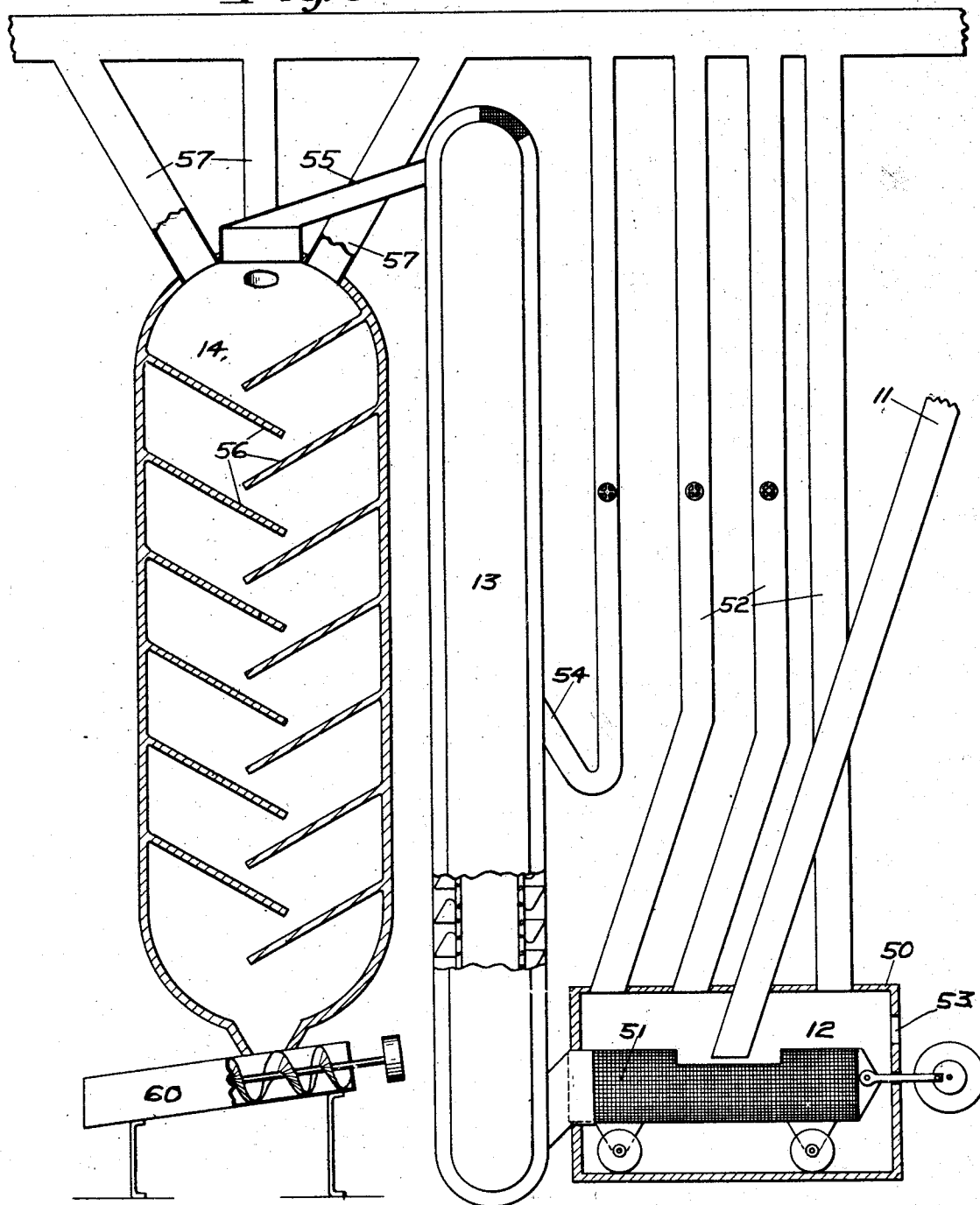
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Filed Feb. 26, 1923

5 Sheets-Sheet 4

Fig. 6



INVENTOR

John Andrews
by W. F. Doolittle
attorney.

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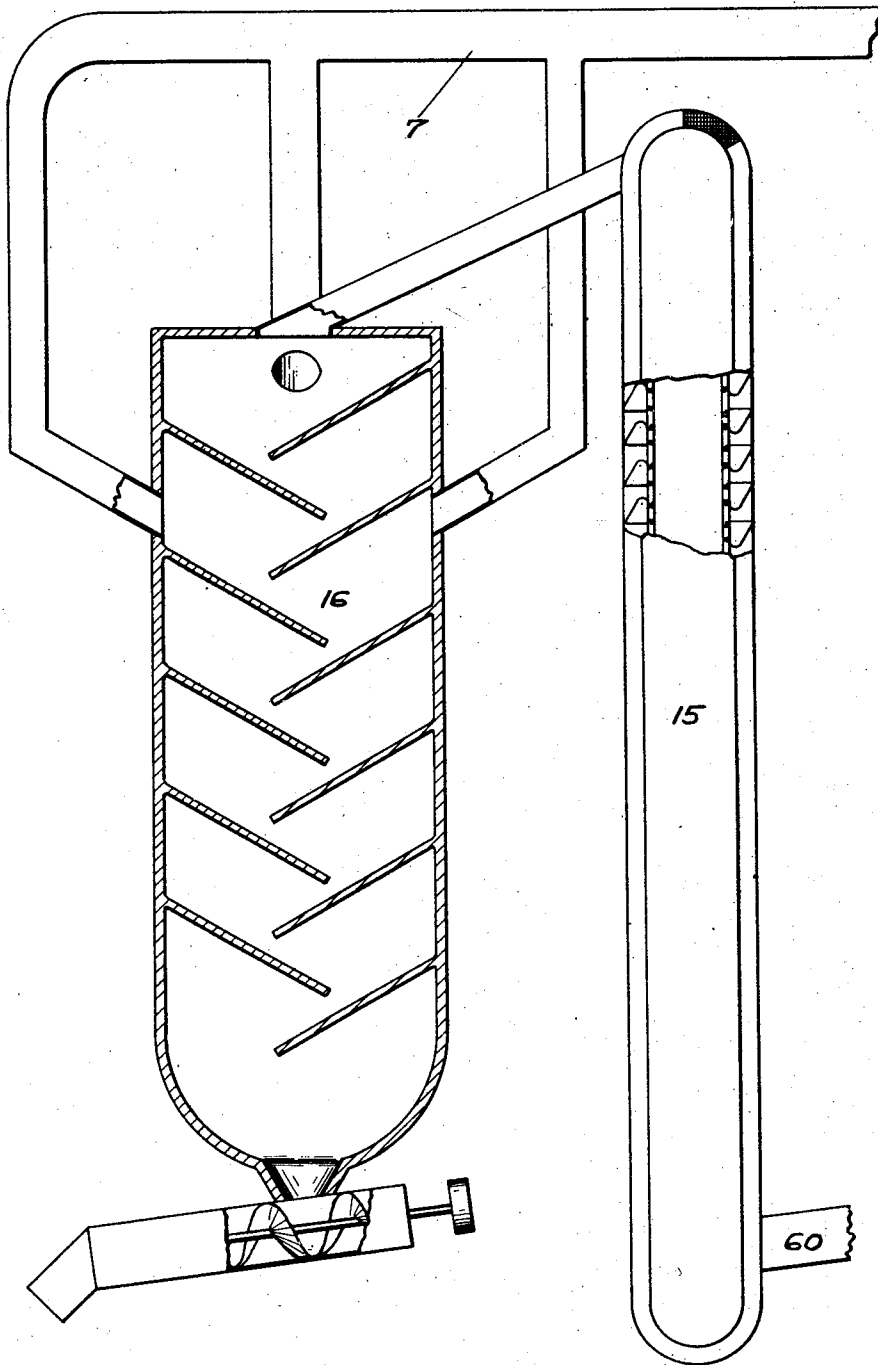
J. ANDREWS

METHOD OF AND APPARATUS FOR CLEANING GRAIN

Filed Feb. 26, 1923

5 Sheets-Sheet 5

Fig. 7



INVENTOR

John Andrews
by W. F. Doolittle
Attorney.

UNITED STATES PATENT OFFICE.

JOHN ANDREWS, OF ELIZABETH, PENNSYLVANIA.

METHOD OF AND APPARATUS FOR CLEANING GRAIN.

Application filed February 26, 1923. Serial No. 621,137.

To all whom it may concern:

Be it known that I, JOHN ANDREWS, a citizen of the United States, residing at Elizabeth, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Methods of and Apparatus for Cleaning Grain, of which the following is a specification.

This invention is for a method of and apparatus for cleaning cereals, particularly wheat, and relates to a process and means for washing the grain in water before it is milled.

In reducing grain to flour or meal, the grain is generally cleaned by blowing a blast of air therethrough. This removes loose dust, bits of straw and grass, and similar foreign matter, but it does not clean the dirt which adheres to the coat of the grain, and particularly wheat, or the dirt which gets into the fold or crease in the wheat berry.

The present invention proposes to wash the grain in water, preferably after it has been cleaned by blowing, to remove the dirt which adheres to the bran coating and in the creases of the berries, and to then dry the grain so that it may be immediately milled.

My invention may be readily understood by reference to the accompanying drawings, in which:

Fig. 1 represents a side view of a complete apparatus for washing and drying the grain;

Fig. 2 is a longitudinal section through the air treating apparatus, which provides drying air for the apparatus;

Fig. 3 is a transverse section through the air washing device for cleaning the air used for drying purposes;

Fig. 4 represents a vertical section through the washing apparatus, showing also the elevator for lifting the washed grain to a discharge which leads to the first drying chamber;

Fig. 5 represents, on a smaller scale, a transverse section in the plane of line V—V of Fig. 4;

Fig. 6 represents a longitudinal section through the first drier and a vertical section through the second drier, which is of a different nature from the first; and

Fig. 7 shows the last drier of the series. In the drawings, 5 designates a fan for

blowing air through a heating furnace 6, from whence it passes into a main pipe 7. The grain is introduced from chute 8 into washer 9, from whence it is lifted by elevator 10 into discharge chute 11, down which it passes into drier 12. From drier 12 it is lifted by elevator 13 and discharged into drier 14. Leaving drier 14, the grain is raised by elevator 15, and discharged into drier 16, which may be the terminal drier, or as many additional driers may be used as are found necessary. Branch pipes leading from the main pipe introduce heated drying air at advantageous points, as hereinafter more fully described.

The washer, shown in detail in Figs. 4 and 5, includes a housing 9 in the form of a vertical cylindrical tank having a central opening at the top thereof, into which chute 8 extends, to introduce grain into the tank. Mounted in the tank on a central shaft 17 is an agitator, preferably comprised of a plurality of radial vanes 18. The shaft 17 is supported at the bottom of the tank by a central bearing 19 carried by webs 20, and near its upper end by a bearing 21. The extreme upper end of the shaft projects outside the top of the tank, and is provided with a bevel gear wheel 22 or other suitable driving means, power being imparted there- to by a shaft 23.

At the top of the tank above the agitator is a pipe 24 through which water is introduced into the tank. This pipe is preferably coiled and provided with a plurality of openings, so that water may be sprayed into the grain.

At the bottom of the tank is a narrow outlet chute 25 which terminates within a reciprocable sieve of fine mesh 26. This screen may be reciprocated in any suitable manner, as by a connecting rod 27 joined thereto and engaging an eccentric pin on wheel 28 driven through belt 29 from the upper power shaft 23. The screen is preferably mounted on rollers 30 engaging rails 31 in a water receiving receptacle 32.

The end of the screen opposite that to which the connecting rod is secured is open and is slidably received in a casing 33, from which leads a chute 34 to bucket conveyor 10. Upon reciprocation of the screen, the wheat is forced out the open end of the screen, from whence it gravitates to the conveyor which elevates it and discharges it

into a chute 11. While the grain is in the sieve, the largest part of the water drains out of the grain.

The sieve is enclosed within a housing 36, and leading into the housing is the double outlet 37 of an air pipe 38. This pipe 38 leads from a main pipe 7, through which heated air is forced from fan 5 and furnace 6.

The air washer and heater for supplying air to pipe 7 is shown in detail in Figs. 2 and 3.

In Fig. 3, 39 is an air intake pipe which leads into a water tank 40. At 41 is the air intake for the fan or pump 5. The fan may be run from a suitable motor by a belt, not shown, engaging pulley 42 of the fan. When the fan is in operation, air is sucked from pipe 39 through the water. This air is forced through pipe 43 into a plurality of pipes 44 that lead through a furnace 6, the pipes terminating in a manifold 46 at the end of pipe 7. The air is thus heated.

Leading from pipe 7 is another air pipe 47 which introduces the heated air into the first conveyor. This air escapes through screening 48 at the top of the elevator. The washed grain from the elevator is discharged down chute 11. An air pipe 49 leads into the top of this chute, so that a current of drying air passes over the descending grain.

The lower end of chute 11 terminates in a drier 12. This drier includes a housing 50 having a reciprocable screen 51 therein, similar to screen 26. Air pipes 52 lead into the housing from pipe 7, and as the grain is shaken about in the sieve, the drying air passes through it. The air may escape through opening 53.

The grain is discharged into elevator 13, similar in all respects to elevator 10, and at 54 is an air pipe leading into this conveyor.

From the conveyor 13, the grain passes down chute 55 into drier 14. This drier comprises a tank of the nature shown in Fig. 6 having a plurality of staggered inclined baffles 56 on the interior thereof. The grain, coming into the upper part of the tank, falls from one baffle onto the next. Air pipes 57 leading from the pipe 7 thoroughly aerate and dry the grain, which may be carried off by conveyor 60. From this conveyor, it is preferably elevated and passed through at least one more drier, or as many more similar driers as necessary, as indicated at 16, and finally discharged, ready for immediate milling. Obviously, the grain would not fall through one of the driers of this type until most of the water is evaporated.

After being thoroughly washed, the grain is immediately aerated and dried, while it is kept more or less continuously agitated,

so as to prevent the grain from being damp or from moulding. By thus washing the wheat, it is insured that the grain is clean and sanitary. As the grain may be preserved better before washing than after, and as it will accumulate dirt if it is allowed to stand, the washing immediately precedes the milling. This apparatus is so devised and organized that the process is substantially continuous.

Various changes and modifications may be made in the construction and arrangement of parts within contemplation of my invention and under the scope of the appended claims.

I claim as my invention:

1. The process of cleaning grain which consists in washing it in water, separating it from the bulk of the water by mechanical agitation while forcing air therethrough, and then passing it immediately through a successive series of drying devices, and continuously forcing currents of air therethrough in the agitator and in the drying devices.

2. A grain cleaning and drying mill comprising an agitator in which the grain is washed with water, a shaking sieve below the agitator for separating the grain and water, a drier, means for transferring the grain from the sieve to the drier, and means for passing a current of air through the sieve and drier.

3. A grain cleaning and drying mill comprising a tank in which is an agitator, means for supplying grain and water thereto, a discharge for the tank, an agitating separator below the tank into which said discharge leads for separating the grain and water, means for transferring said grain to a drier, and means for introducing a current of air into the drier and into the said transferring means.

4. A grain cleaning and drying mill comprising an agitator, means for supplying grain and water thereto, a separator into which the contents of the agitator flow, said separator acting to drain the water from the grain, a series of vertical driers through which grain may gravitate arranged to aerate and dry the grain while it is kept in motion, means for transferring grain from the separator to the top of the first drier, and means interposed between each drier for transferring the grain successively from the bottom of one drier to the top of the next.

5. A grain cleaning and drying mill comprising an agitator, means for supplying grain and water thereto, an agitating separator into which the contents of the agitator flow, said separator acting to drain the water from the grain, a series of vertical driers arranged to aerate and dry the grain while it is kept in motion, means for transferring grain from the separator to the first drier,

means interposed between each drier for transferring the grain successively from one drier to the next, means for introducing a current of air to circulate through the grain at various points in the mill, and various air outlets at different points in the mill.

5 6. A grain cleaning and drying mill comprising an agitator, means for supplying grain and water thereto, a separator into
10 which the contents of the agitator flow, said separator acting to drain the water from the grain, a series of driers arranged to aerate and dry the grain, while it is kept in motion, means for transferring grain
15 from the separator to the first drier, means interposed between each drier for transferring the grain successively from one drier to the next, and means for introducing a current of drying air into said driers and
20 into said transferring means, whereby the grain is aerated both in the driers and while being transferred from one point to another.

25 7. A grain cleaning and drying mill comprising a tank having an agitator therein, means whereby grain and water may be introduced into the tank, a discharge at the

bottom of the tank, a shaking screen into which the tank discharges, said shaking screen serving to separate the bulk of the water from the grain, vertical drying apparatus through which grain may gravitate from the top thereof to the bottom, and an elevating conveyor for receiving grain from the screen and transferring it to the top
30 of the drying apparatus. 35

8. A grain cleaning and drying mill comprising an agitating washer, means for introducing grain and water into the washer, a discharge for the washer, means for receiving the grain and water discharged from the tank including a shaker which separates the grain and water, a second shaker in which the grain is partially dried, means for receiving grain from the first shaker
40 and transferring it to the next, drying means for further drying the grain, means for transferring the grain from the second shaker to the drying apparatus, and means for forcing a current of air through the
45 shakers and transferring means. 50

In testimony whereof I affix my signature.

JOHN ANDREWS.