R. J. OWENS.

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APPLICATION FILED SEPT. 23, 1912.

1,051,158.

Patented Jan. 21, 1913

5 SHEETS—SHEET 1.

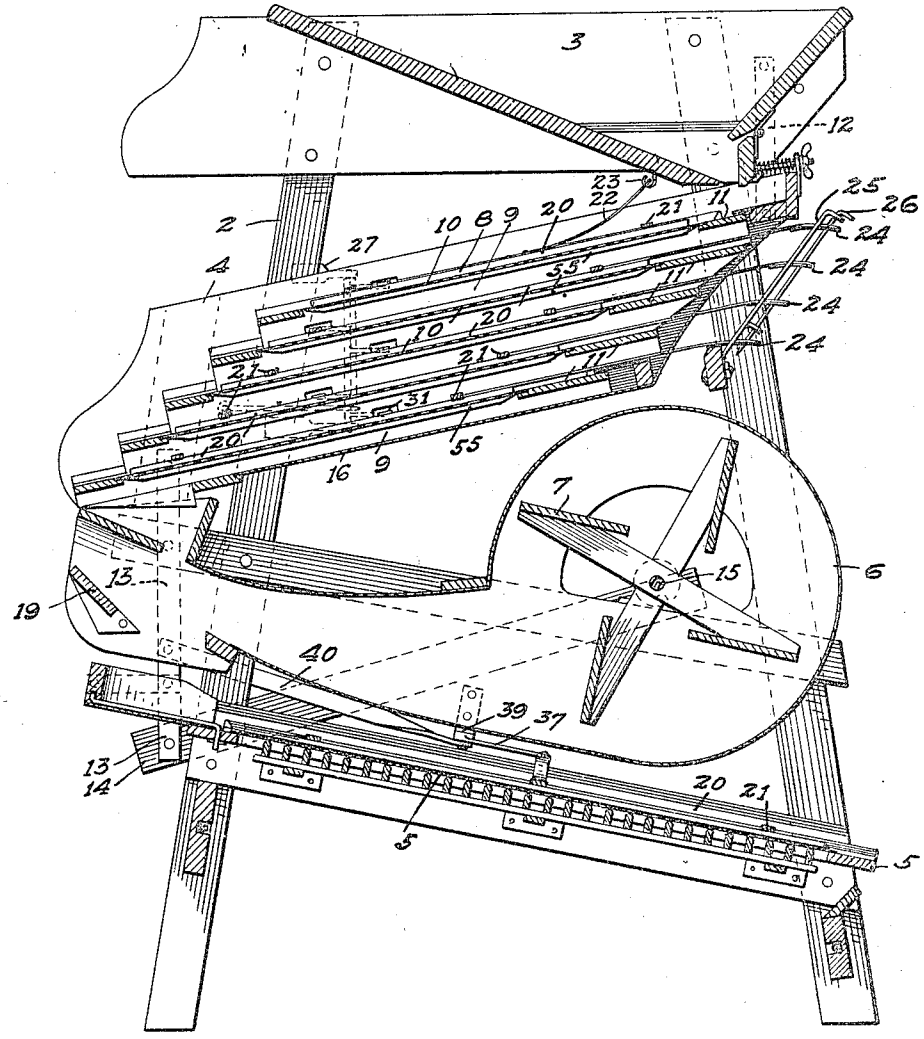

FIG. 1

WITNESSES

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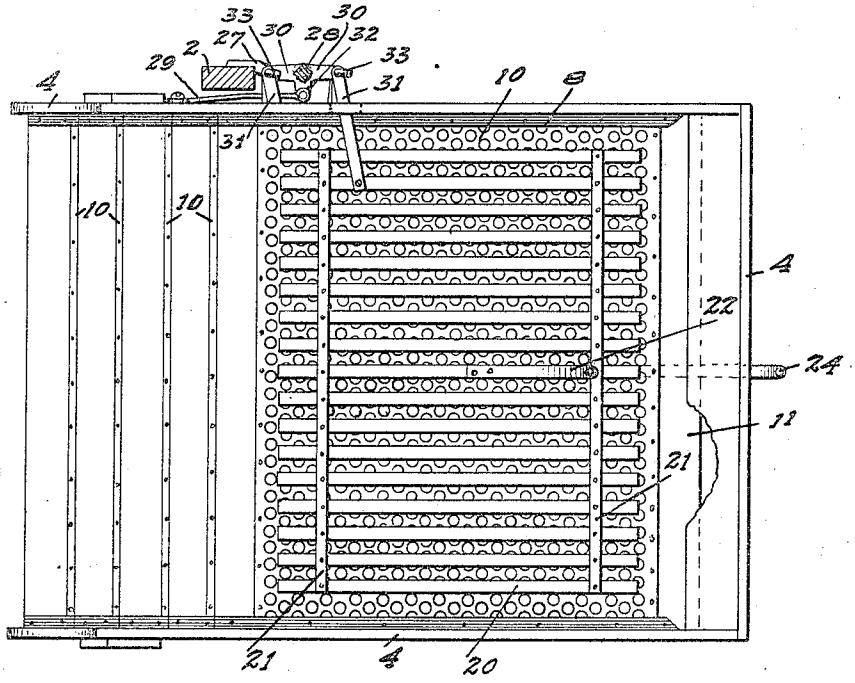

FIG. 2.

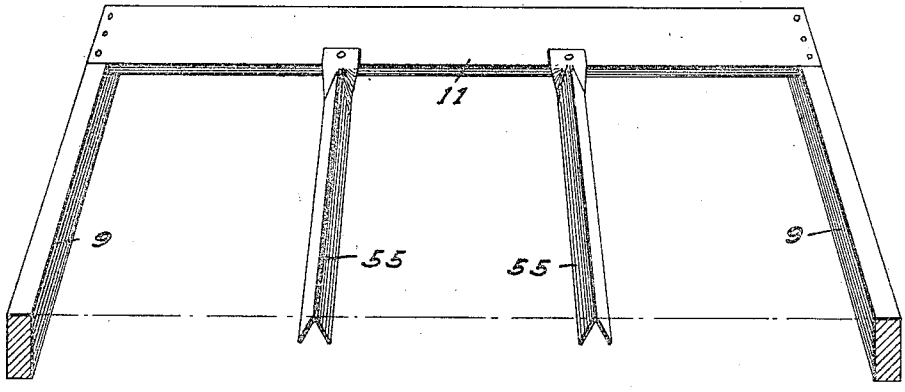

FIG. 3.

WITNESSES

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5 SHEETS—SHEET 3.

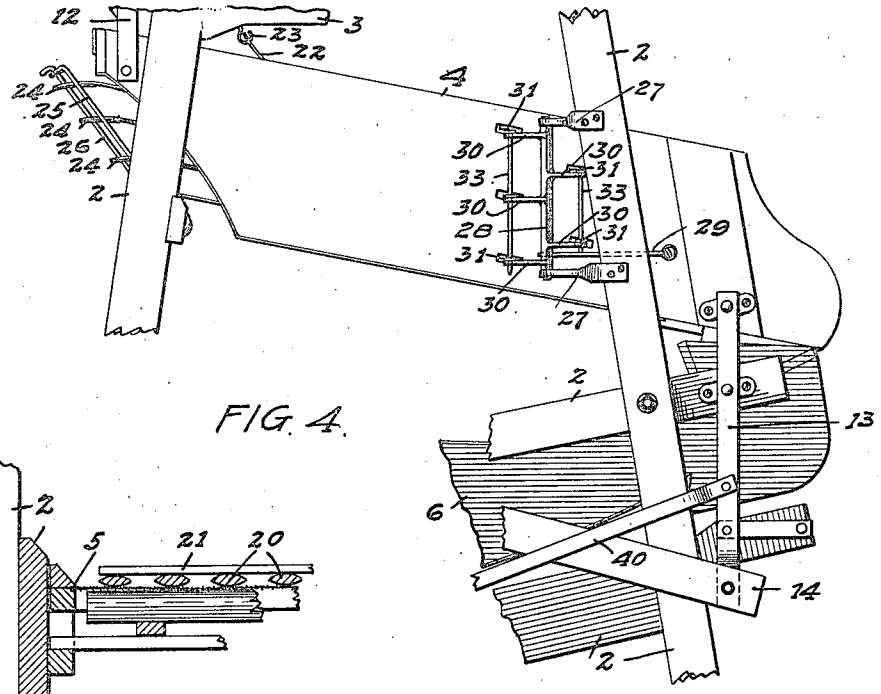

FIG. 4.

FIG. 6.

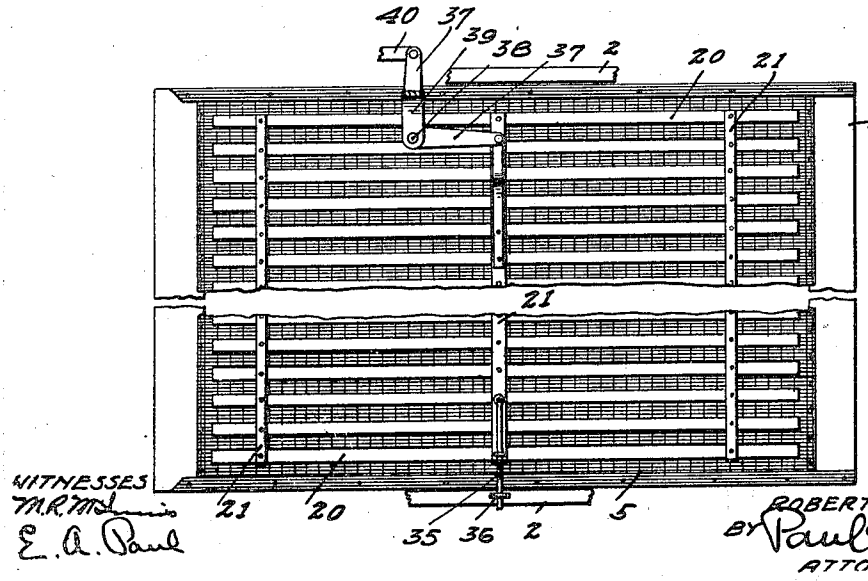

FIG. 5.

WITNESSES

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5 SHEETS—SHEET 4.

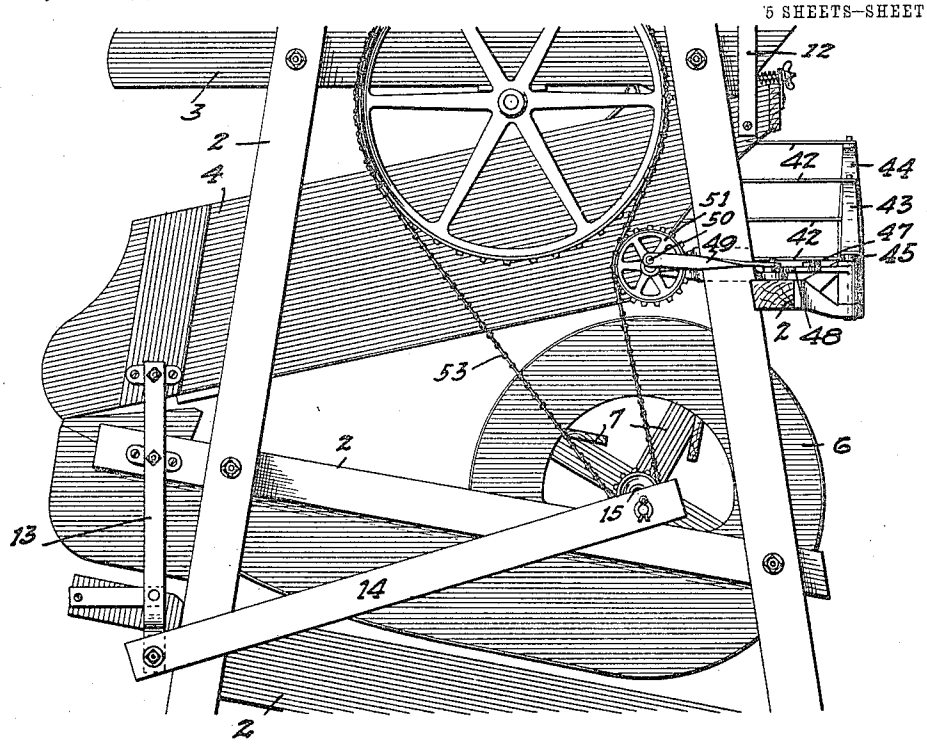

FIG. 7.

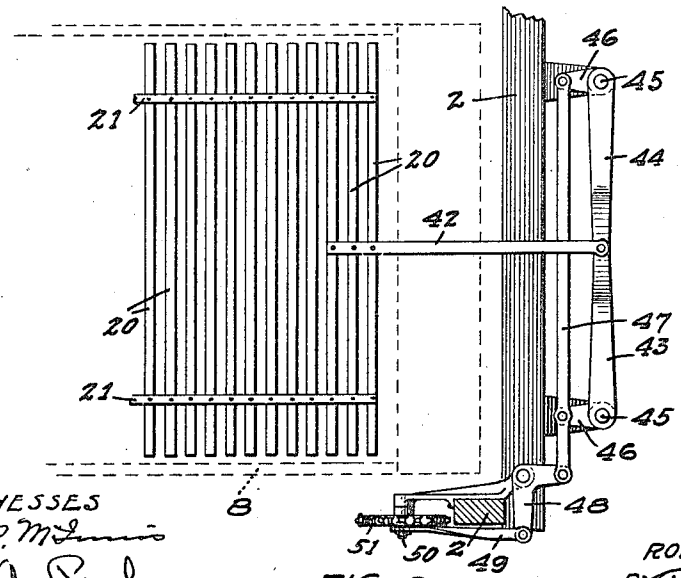

FIG. 8.

WITNESSES

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5 SHEETS—SHEET 5.

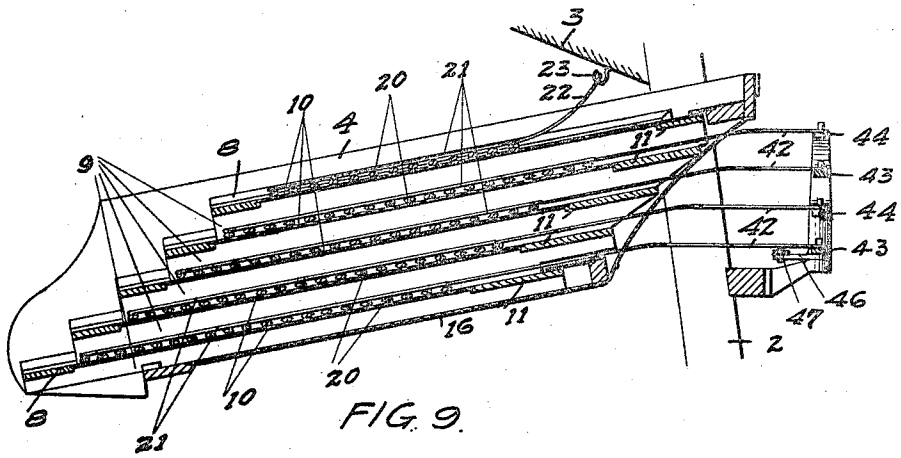

FIG. 9.

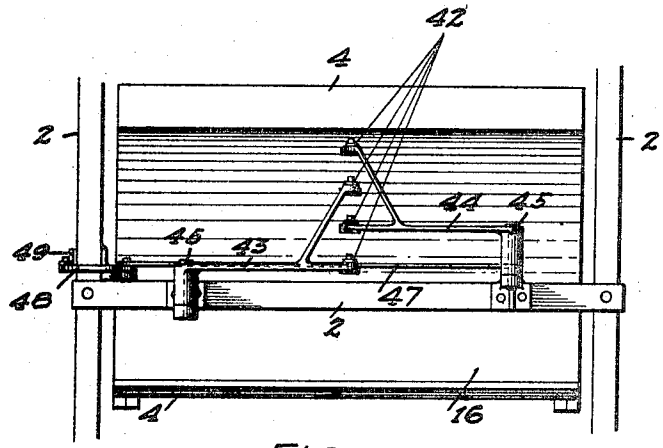

FIG. 10

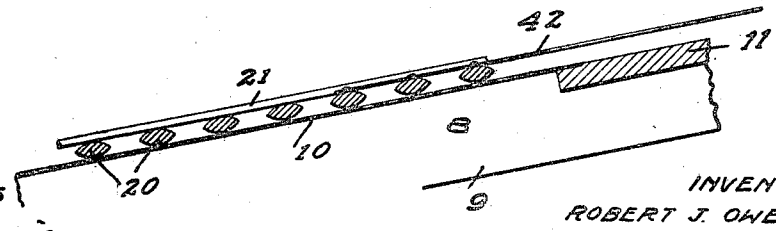

FIG. 11

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UNITED STATES PATENT OFFICE.

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1,051,158. Specification of Letters Patent. Patented Jan. 21, 1913.

Application filed September 23, 1912. Serial No. 721,786.

To all whom it may concern:

Be it known that I, ROBERT J. OWENS, 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-Separators, of which the following is a specification.

This invention relates particularly to improvements in grain separators and the improvements herein described are designed particularly for the class of separators known as fanning mills, and they are especially valuable when such mills are to be used for separating wheat from oats. They are also desirable for separating other grains and seeds.

The object of my present invention is to provide a grain separator having large capacity by means of which different grains or seeds, particularly wheat and oats, may be readily separated from each other.

The invention consists generally in the constructions and combinations hereinafter described and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a longitudinal vertical section of a grain separator or fanning mill embodying my invention, Fig. 2 is a plan view of the upper hurdle, showing the upper sieve and the tail portions of the other sieves and showing my improved sieve cleaner arranged upon the upper sieve, Fig. 3 is a partial perspective view of one of the sieve frames showing the intermediate bars or rails for holding the sieve plate in a horizontal position or keeping it from sagging, Fig. 4 is a partial side elevation of a mill embodying my invention, showing the means for reciprocating the sieve cleaner, Fig. 5 is a plan view of the lower screen showing the cleaner applied thereto, Fig. 6 is a detail section through a portion of the lower screen and the cleaner arranged thereon, Fig. 7 is a partial side elevation of a mill with a modified arrangement of the cleaner, Fig. 8 is a partial plan view showing the cleaner used in Fig. 7, Fig. 9 is a longitudinal vertical section of the upper shoe, screens and cleaners of Fig. 7, Fig. 10 is an end elevation of a portion of the mill shown in Fig. 7. Fig. 11 is a detail section showing the sieve and one of the cleaners on a larger scale.

In all of the drawings 2 represents the frame of the fanning mill, which is here shown as provided with a feed hopper 3, a longitudinally reciprocating sieve shoe 4, a lower reciprocating sieve 5, a fan casing 6 and a fan 7 arranged within the casing 5 and adapted to cause a current of air to pass through the grain and material as it falls from the upper shoe to the lower sieve.

The upper shoe is preferably provided with a series of sieves 8, each sieve consisting of a suitable sieve frame 9, and a perforated sheet metal sieve plate 10. These sieves are mounted in the shoe 4 in the usual way with the lower end of each sieve projecting beyond the lower end of the sieve next above it in the manner in which such sieves are usually arranged in fanning mills.

The head of each sieve frame is preferably provided with a board or deck 11, and the shoe 4 in which said sieves are mounted is preferably supported at its upper end by hangers 12, and at its lower end by pivoted supporting arms 13. The lower ends of the arms 13 are preferably connected to bars 14 that in turn are connected with suitable crank pins carried by the fan shaft 15. This fan shaft carries the fan 7 arranged within the casing 6. The arms 13 are also preferably connected to the lower sieve 5 by suitable links. By this means as the shaft 15 is rotated the shoe 4 and the lower sieve 5 are each given a longitudinal reciprocatory movement, said shoe and sieve, however, at all times moving in opposite directions.

The grain from the hopper passes on to the upper end of the top sieve in the shoe 4 and the vibratory movement of the shoe tends to cause the grain to work toward the lower end of the shoe, and during this operation one grain is separated from another by the passage of one grain over the ends of the sieves while the other passes through the sieves on to a lower deck 16. The grain which passes through the sieves on to the deck 16 falls from the lower end of said deck on to a deck located at the head of the lower sieve 5, and thence passes on to the head end of the sieve 5. As the grain falls from the lower end of the deck 16 to the deck at the head of the sieve 5 it is subjected to a current of air from the fan 7, and the dust and the dirt is blown out. A pivoted plate 19 is preferably arranged at the end of the air-trunk and said plate may be

turned to regulate and direct the discharge of air from the said trunk.

The sieve plates in the upper shoe are preferably formed of perforated zinc or sheet metal. The perforations in said sieves are usually of sufficient size to permit the wheat or short kernels of grain to readily fall through them, while the oats or longer kernels can only get through by turning up endwise. As most of the oats will lie flat upon the sieve it follows that by using a hurdle of sieves of this character, most of the oats will be taken out of the wheat. Some of the oats will, however, owing to the vibration of the shoe, turn up endwise and go through the perforations with the wheat. Some of the oats will also turn up far enough to have their ends project into the perforations and they will often remain for a considerable period of time in this position. Large kernels of wheat will also at times lodge in the perforations, thereby plugging said perforations and preventing other grain from passing through them. For the purpose of preventing the oats from turning up endwise and passing through the perforations, and for knocking down any oat kernels that get ended up and lodged in the perforations, and also for keeping the perforations clear of wheat kernels that might lodge therein, or for keeping them clear of sticks or any seeds or material that might lodge in them, I provide preferably upon each sieve a vibratory cleaner that is rapidly reciprocated back and forth over the surface of the sieve and the movement of which keeps the perforations free and clear of grain or other things that might lodge in them, and which will knock down any oat kernels that get partially into the perforations and which would eventually work through them, and which also, to a large extent, prevents the oats from turning up endwise as they pass down over the sieve. This cleaner consists preferably of a series of cleaner bars or slats 20, arranged parallel to each other, and separated from one another preferably a distance substantially equal to the width of said bars. The cleaner bars are arranged parallel to each other, and are formed into a grid by transverse connecting bars 21 which are preferably rigidly nailed or otherwise secured to the tops of said bars. Each of said bars 20 has preferably a rounded lower surface, and also preferably a rounded upper surface, thereby giving to each of said bars in cross section a substantially oval form. I find it important to have these bars of curved form on the under side, so that their line of bearing upon the sieve plate is very narrow, and I also find it desirable to have them of curved form on top so that none of the grain or material will lodge thereon, but if any falls on to the top of the bars it will immediately slide off on to the sieve. In Figs. 1 and 2 of the drawings I have shown these bars extended lengthwise of the sieves, and I consider this the preferable arrangement. I have also shown the bars in use upon the lower sieve 5, and in this instance also I have shown the bars extending lengthwise of said sieve (see Figs. 5 and 6). In Figs. 7, 8, 9, 10 and 11, I have shown the cleaner bars extending crosswise of the sieve. Otherwise, except for a slight difference in detail of the means for reciprocating the grids of cleaner bars, both constructions are substantially alike.

In the construction shown in Figs. 1, 2 and 4, in which the grids are reciprocated crosswise of the sieves, I preferably connect the top grid by a strap 22, to a hook 23 on the hopper, and I connect the other grids to straps 24, that extend through a post 25 and are held in position by a rod 26, which slides through supports in the post 25 and through holes in the ends of the straps 24. Then to reciprocate the sieves I secure upon the frame of the machine in bearings 27 an upright bar 28 having an inwardly projecting arm 32 connected by a strap 29 to the reciprocating shoe 4 (see Figs. 1 and 2). This upright is provided with as many arms 30 as there are sieves in the shoe 4. I have here shown three arms 30 projecting from one side of the upright, and two from the other. A short strap 31 is connected to each sieve frame and extends over the end of one of the arms 30 and pins 33 extend through the straps and through the arms 30 thereby connecting said straps with said arms. As the shoe 4 is reciprocated the upright 28 is oscillated in its bearings and the arms 30, through the straps 31, give to the grids of bars short reciprocating movements across the sieves. The sieves are reciprocated longitudinally with the shoe 4, and the grids of cleaner bars, in the construction shown in Figs. 1, 2 and 3 of the drawings, are rapidly reciprocated transversely across said sieves. The throw of the oscillating arms 30 is sufficient preferably to cause the grid to move in each direction a distance fully equal to the space between the bars. If, therefore, any of the oats tend to assume an upright positipn they are almost sure to be struck by the edges of the bars and tipped over into a flat position on the sieve. If any of the oats get into an inclined position with their ends partly projecting through the perforations they will ordinarily be hit by the bars and knocked out of the holes and turned down to a horizontal position. The bars will also tend to keep the sieves clean, either by knocking the obstructions out of the holes or, as will more commonly occur, by the rounded surfaces of the bars riding over the obstructions and forcing them through the perforations.

In the structure shown in Fig. 5 for reciprocating the grid upon the lower sieve, I may employ a wire 35, secured to the grid and projecting through a guide 36 on the frame. This wire tends to maintain the grid with its bars parallel with the side bars of the sieve 5. For reciprocating the grid I provide a bell crank lever 37 pivoted at 38 on a bracket 39 secured to the side wall of the machine and I also provide a connecting bar 40 that has one end connected to the bell crank lever 37 and the other end connected to the oscillating bar 13. By this means the grid resting on the sieve 5 is given a rapid reciprocation crosswise of said sieve, and it tends to keep the sieve clean and free from large grains and seeds.

In the structure shown in Figs. 7 and 11 of the drawings the cleaning bars are arranged crosswise of the sieves and are reciprocated in the same direction as the sieves, but they are given an independent reciprocatory movement, which is more rapid than the movement of the shoe and sieves. For this purpose I connect a strap 42 to each of said grids and extend it beyond the end of the shoe, and I connect two of said straps to the vibrating arms 43 and two of them to the arms 44. These arms are mounted upon the pivots 45 provided with short bell cranks 46 which are connected to a rod 47 that is in turn connected to a bell crank 48, and this bell crank is connected by a strap 49 to an eccentric pin 50 on a sprocket wheel 51, and is driven by a chain 53 from the fan shaft. With this construction, which is clearly illustrated in Fig. 8 of the drawings, as the shoe 4 is given a longitudinal reciprocation the grids of cleaner bars resting upon the sieves are also reciprocated longitudinally of the sieves, but independently thereof. The reciprocatory movement of the grids of cleaner bars not only tends to keep the sieves clean in the manner already described, but the bars act to crowd the grain toward the tail-ends of the sieves, thereby accelerating the travel of the grain over the sieves, and materially increasing the capacity of the machine.

In every instance the grids of bars resting upon the sieves tend, by their reciprocatory movement, to prevent the oats from assuming an upright position and passing through the sieves, for the reason that if the oats assume this position they are struck by the reciprocatory bars and knocked down into a flat position. Any grain, seeds or other material lodging in the perforations is dislodged therefrom by the reciprocatory bars, either by being knocked out of the perforations or by being pushed through the perforations as the curved under surfaces of the bars ride over such lodged grain or material.

In order that the sieve plates may be prevented from sagging and thereby getting into a position in which the bars would not come in contact throughout their length with the surface of the plates, I prefer to provide intermediate brace bars 55 preferably formed of sheet metal bent into triangular form, and to secure these bars to the opposite ends of the sieve frame with the angle uppermost whereby the bars are in contact throughout their length with the under surface of the sieve plates, thereby holding said plates horizontal and preventing them from sagging. With this arrangement the cleaner bars will be in contact throughout their length with the upper surfaces of the sieve plate.

I do not limit myself to the details of the construction herein shown and described, as the same may be varied in many particulars without departing from my invention.

I claim as my invention:

1. The combination, in a grain separator, with a series of superimposed sieves, of a series of cleaner bars resting upon said sieves, means connecting the bars on each sieve, means for reciprocating said sieves, and means for independently reciprocating said bars.

2. The combination, in a grain separator, with a series of superimposed sieves, and means for longitudinally reciprocating said sieves, of a series of cleaner bars resting upon said sieves and extending longitudinally thereof, means connecting the bars on each sieve and thereby forming a grid, means for maintaining the upper surfaces of the sieves and the under surfaces of the cleaner bars in parallel planes and means for reciprocating said bars transversely to the line of reciprocation of said sieves.

3. The combination, in a grain separator, with a series of superimposed sieves, of a series of cleaner bars extending lengthwise of said sieves, means connecting said bars on each sieve and thereby forming a grid, means for maintaining the upper surfaces of the sieves and the under surfaces of the cleaner bars in parallel planes and means for reciprocating said bars transversely of said sieves.

4. The combination, in a grain separator, with a suitable inclined sieve, of a series of cleaner bars extending lengthwise of said sieve, means connecting said bars and suitably spacing the same, means for maintaining the upper surfaces of the sieves and the under surfaces of the cleaner bars in parallel planes and means for reciprocating said bars transversely of said sieve.

5. The combination, in a grain separator, with an inclined sieve, of a series of cleaner bars having rounded under surfaces resting upon said sieve, means connecting said bars and suitably spacing them one from another, means for reciprocating said sieves and

means for independently reciprocating said bars transversely of said sieve.

6. The combination, in a grain separator, with an inclined sieve, of a series of cleaner bars resting upon and extending lengthwise of said sieve, said bars being provided with rounded lower and rounded upper surfaces, means connecting said bars and suitably spacing them one from another, means for reciprocating said sieves and means for independently reciprocating said bars transversely of said sieve.

7. The combination, in a grain separator, with a series of superimposed sieves, of a series of cleaner bars provided with rounded lower surfaces resting upon said sieves, means connecting the bars on each sieve, and suitably spacing said bars one from another, means for reciprocating said sieve and means for independently reciprocating said bars.

8. The combination, in a grain separator, with a series of superimposed sieves and means for longitudinally reciprocating said sieves, of a series of cleaner bars provided with rounded lower surfaces, resting upon said sieves, and extending longitudinally thereof, means connecting the bars on each sieve and suitably spacing them one from another, and means for reciprocating said bars transversely to the line of reciprocation of said sieves.

In witness whereof, I have hereunto set my hand this 13th day of September 1912.

ROBERT J. OWENS.

Witnesses:

GENEVIEVE E. SORENSEN,

EDWARD A. PAUL.