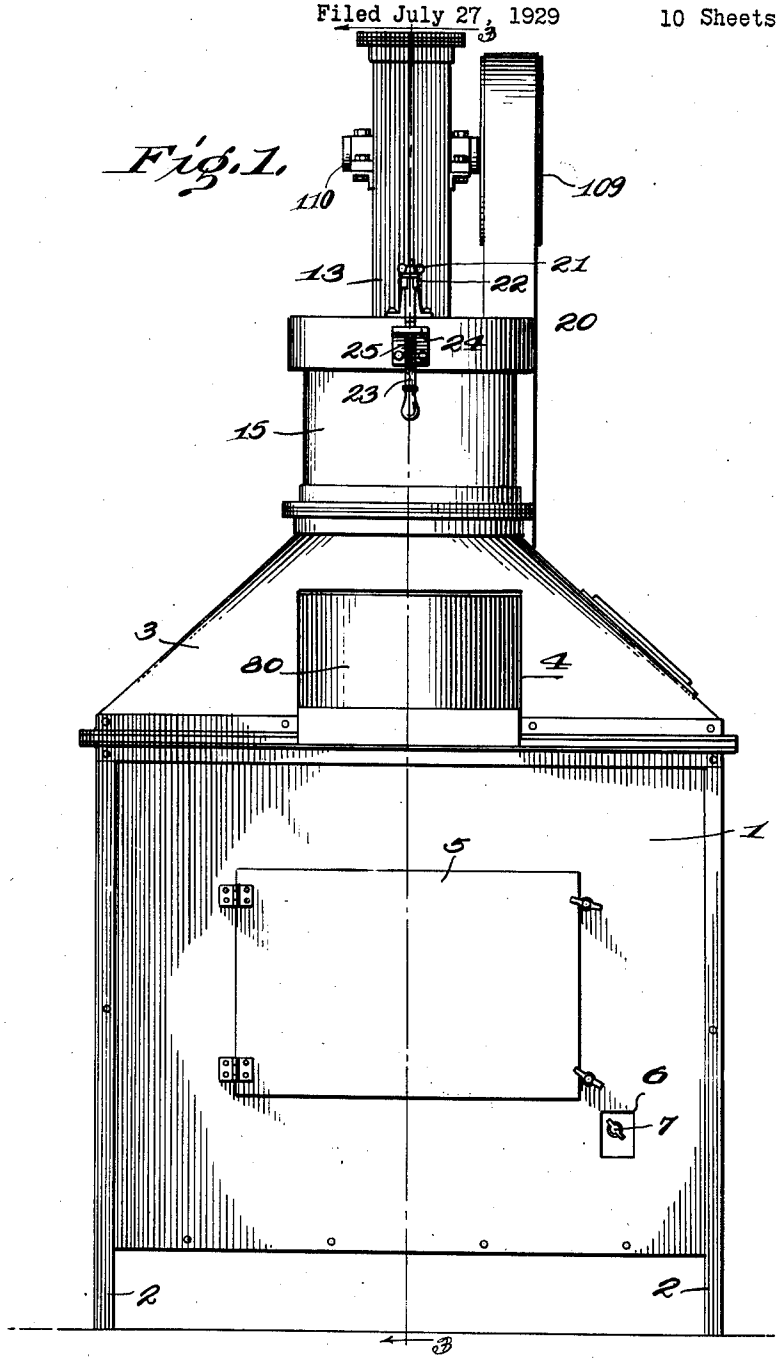
July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

Filed July 27, 1929 10 Sheets-Sheet 1

Fig. 1.



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July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

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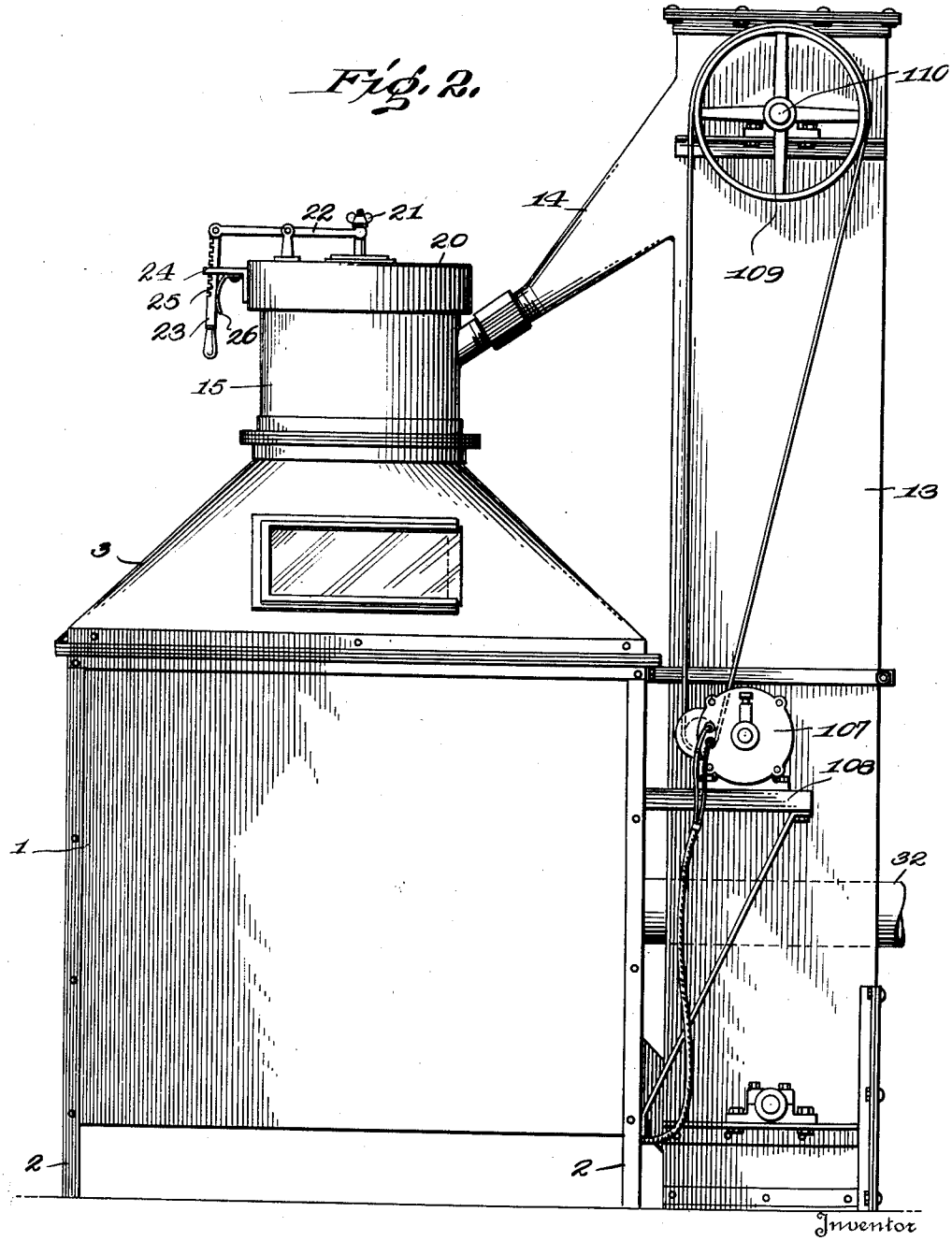
Fig. 2.



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EGG CLEANING MACHINE

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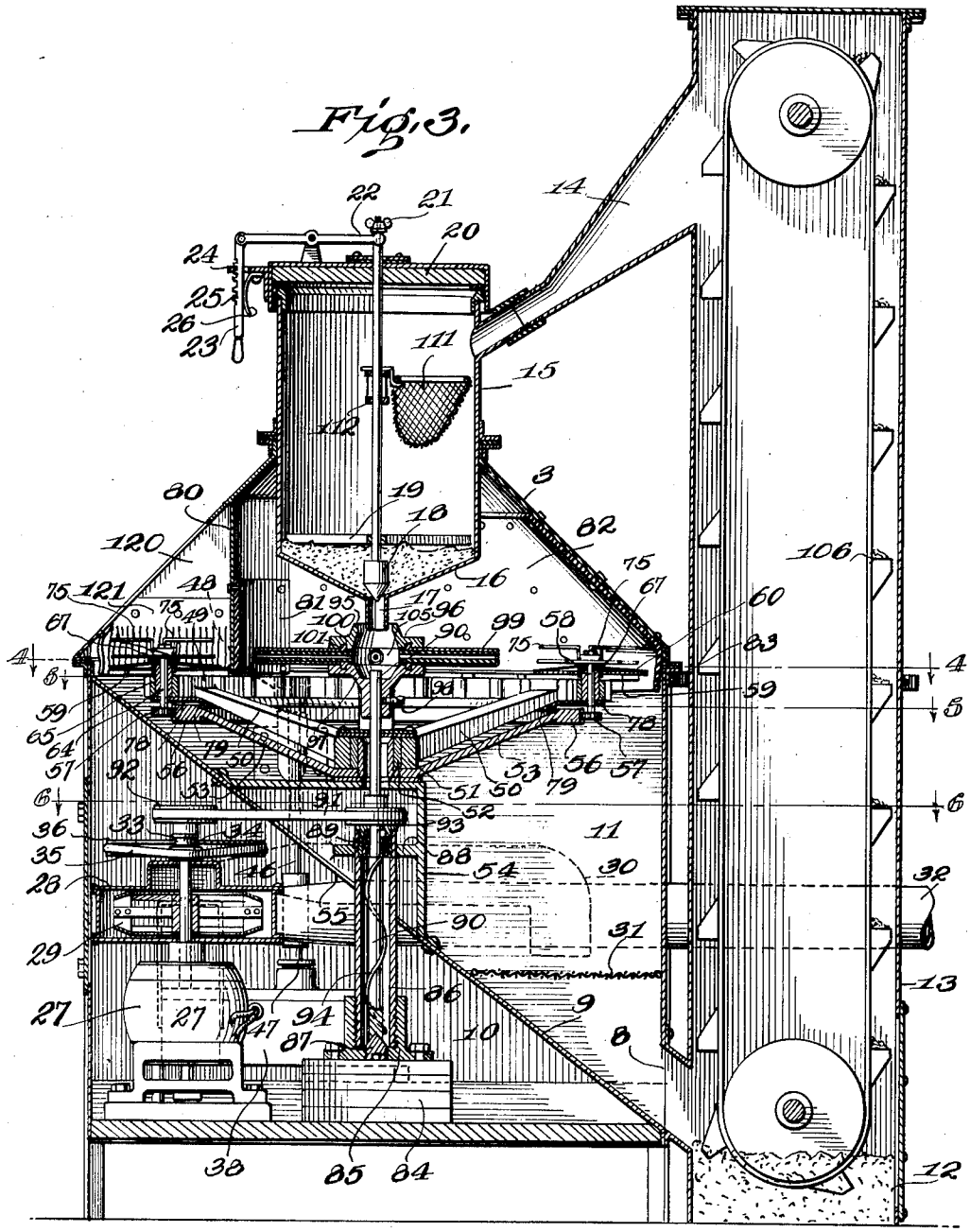
Fig. 3.



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July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

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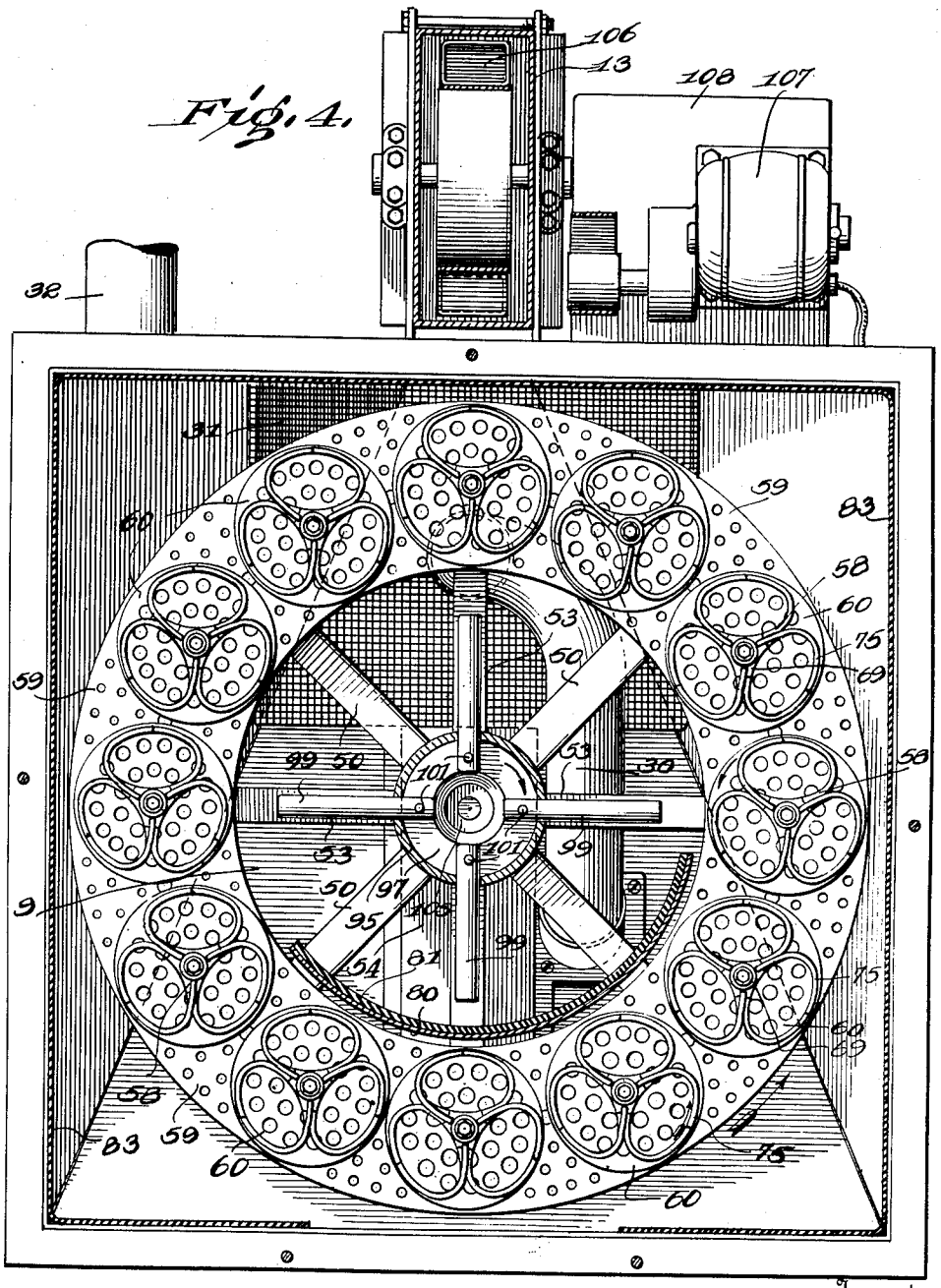
Fig. 4.



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July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

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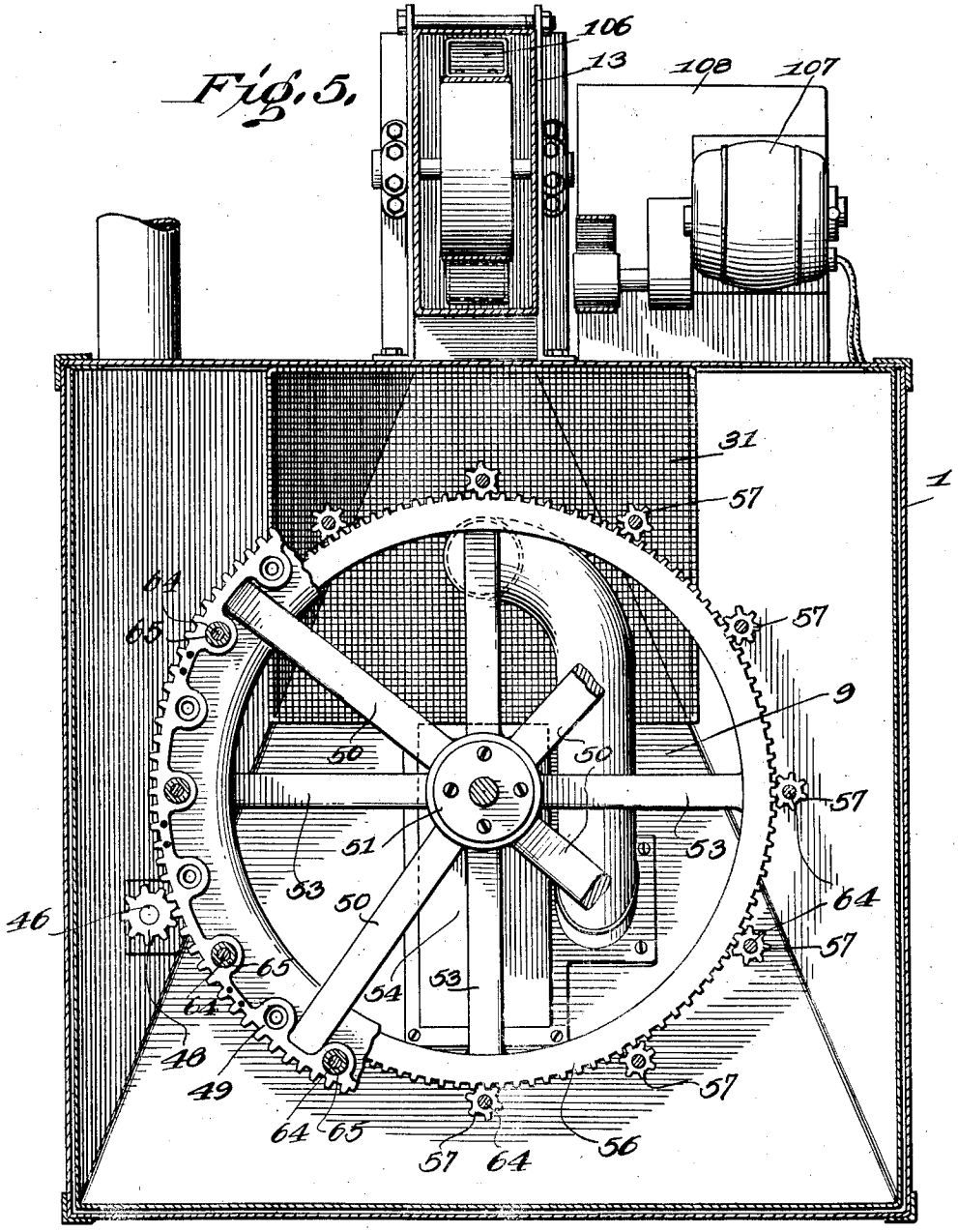
Fig. 5.



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July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

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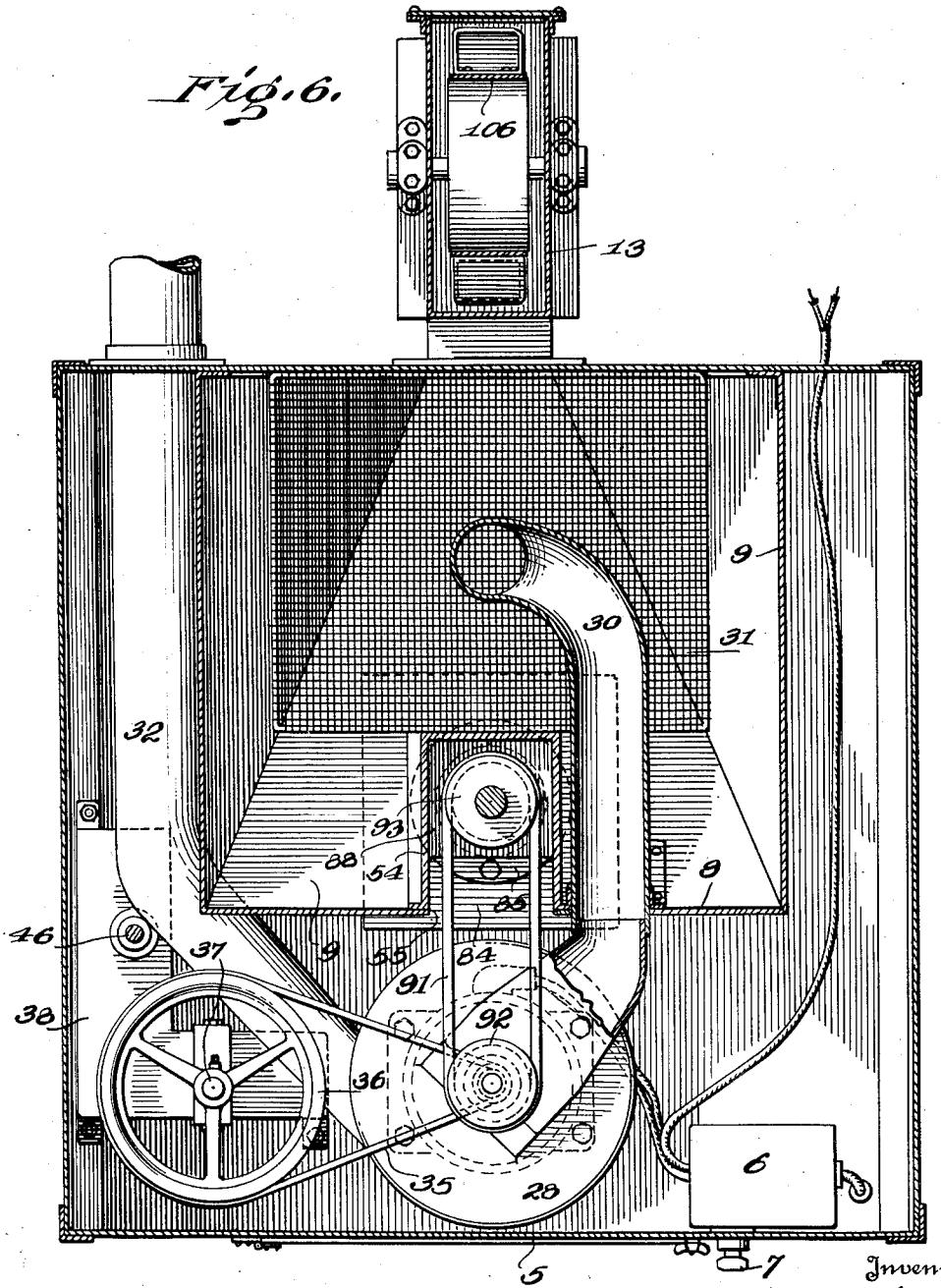
Fig. 6.



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July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

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Fig. 7.

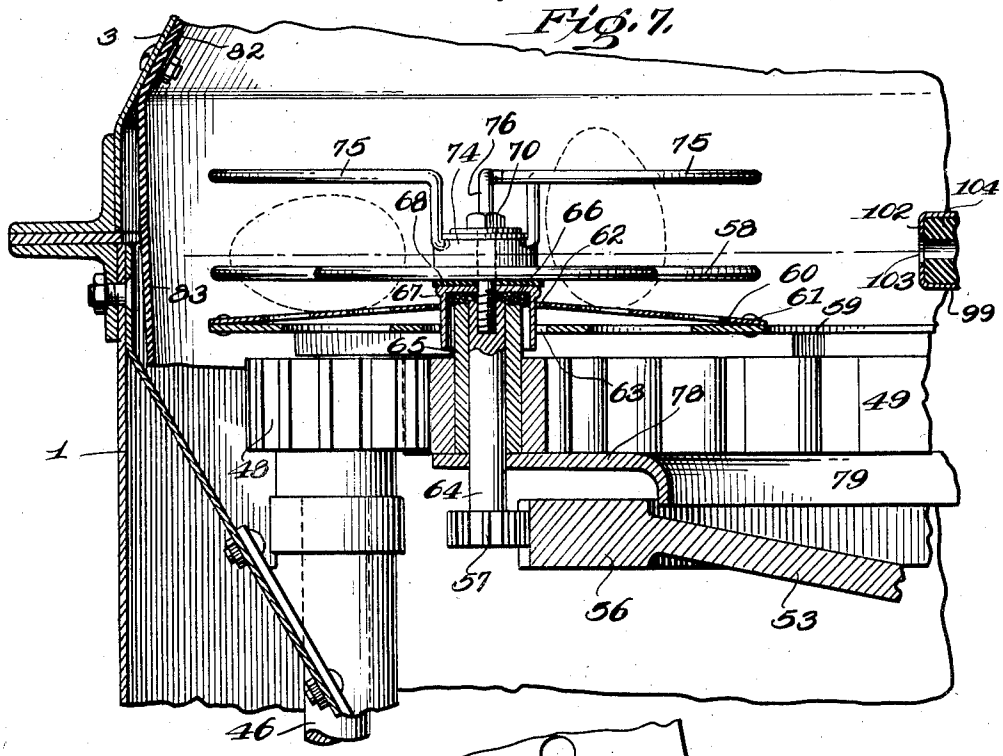

Fig. 8.

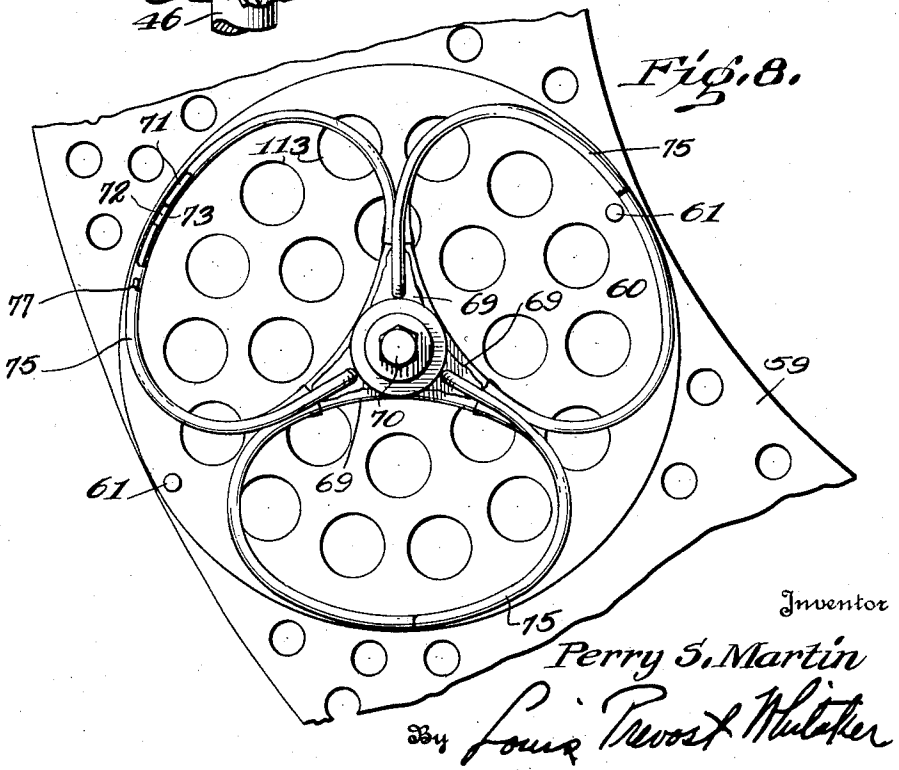

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Fig. 9.

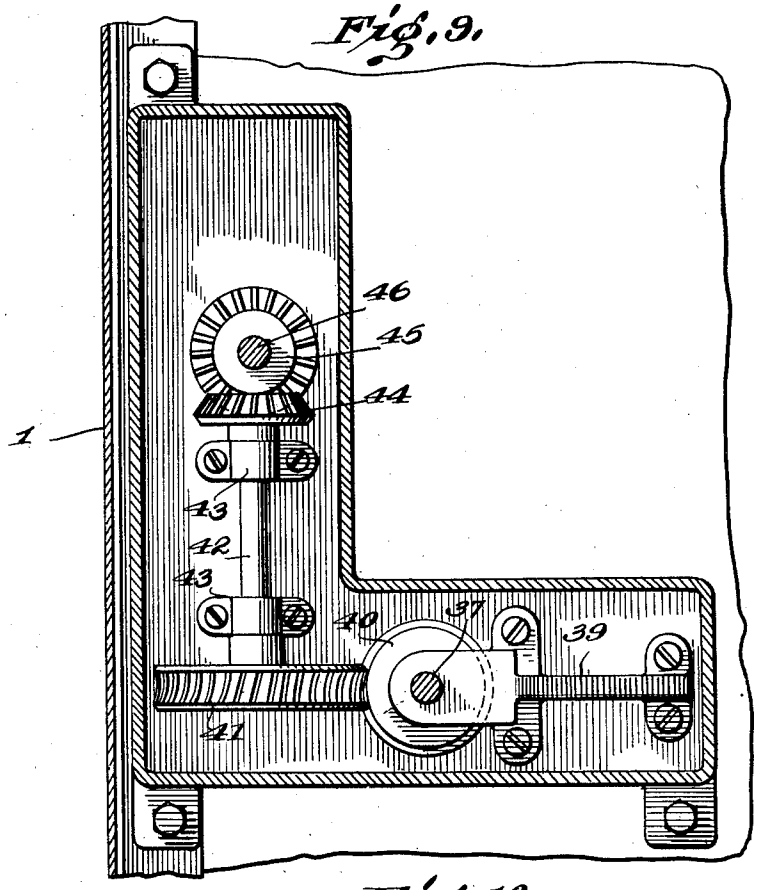
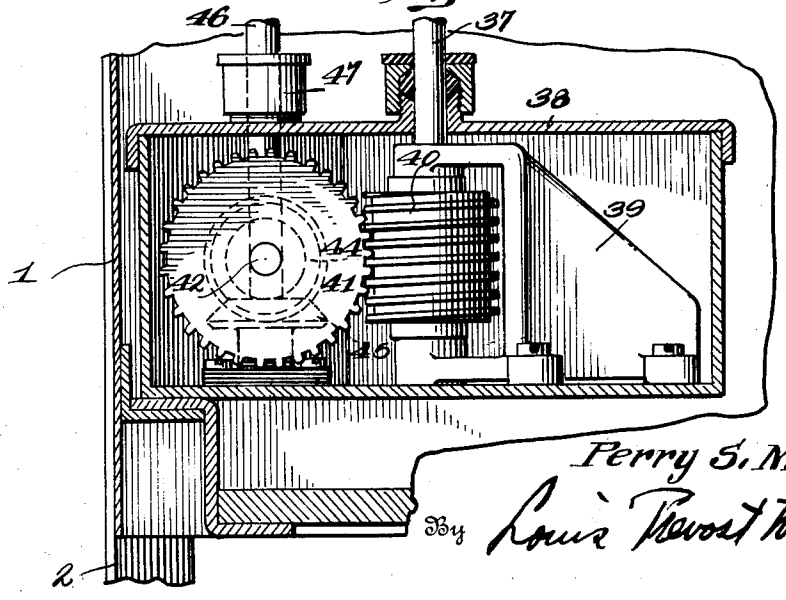


Fig. 10.



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July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

Filed July 27, 1929 10 Sheets-Sheet 9

Fig. 12.

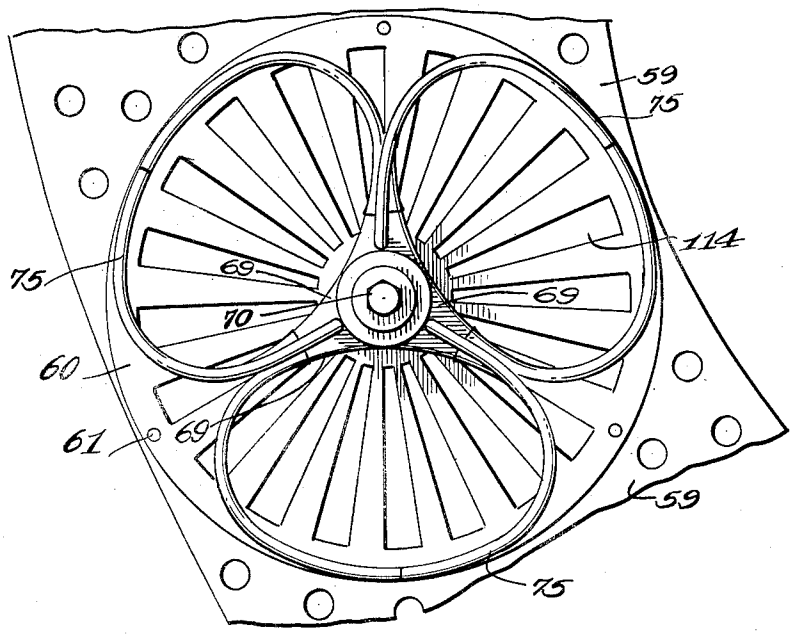


Fig. 14.

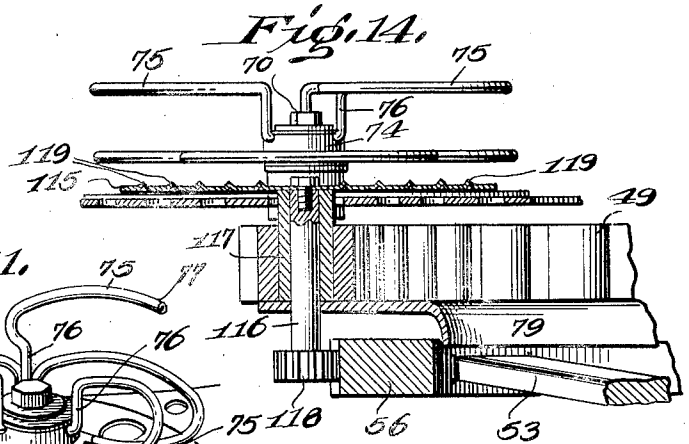
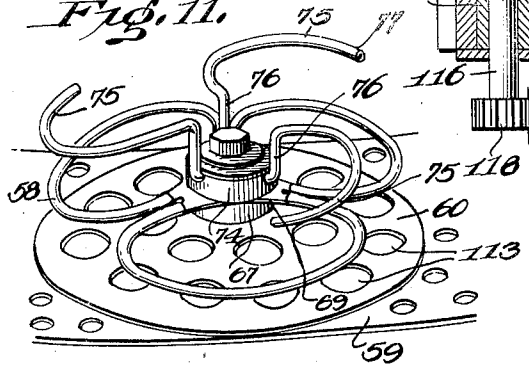


Fig. 11.



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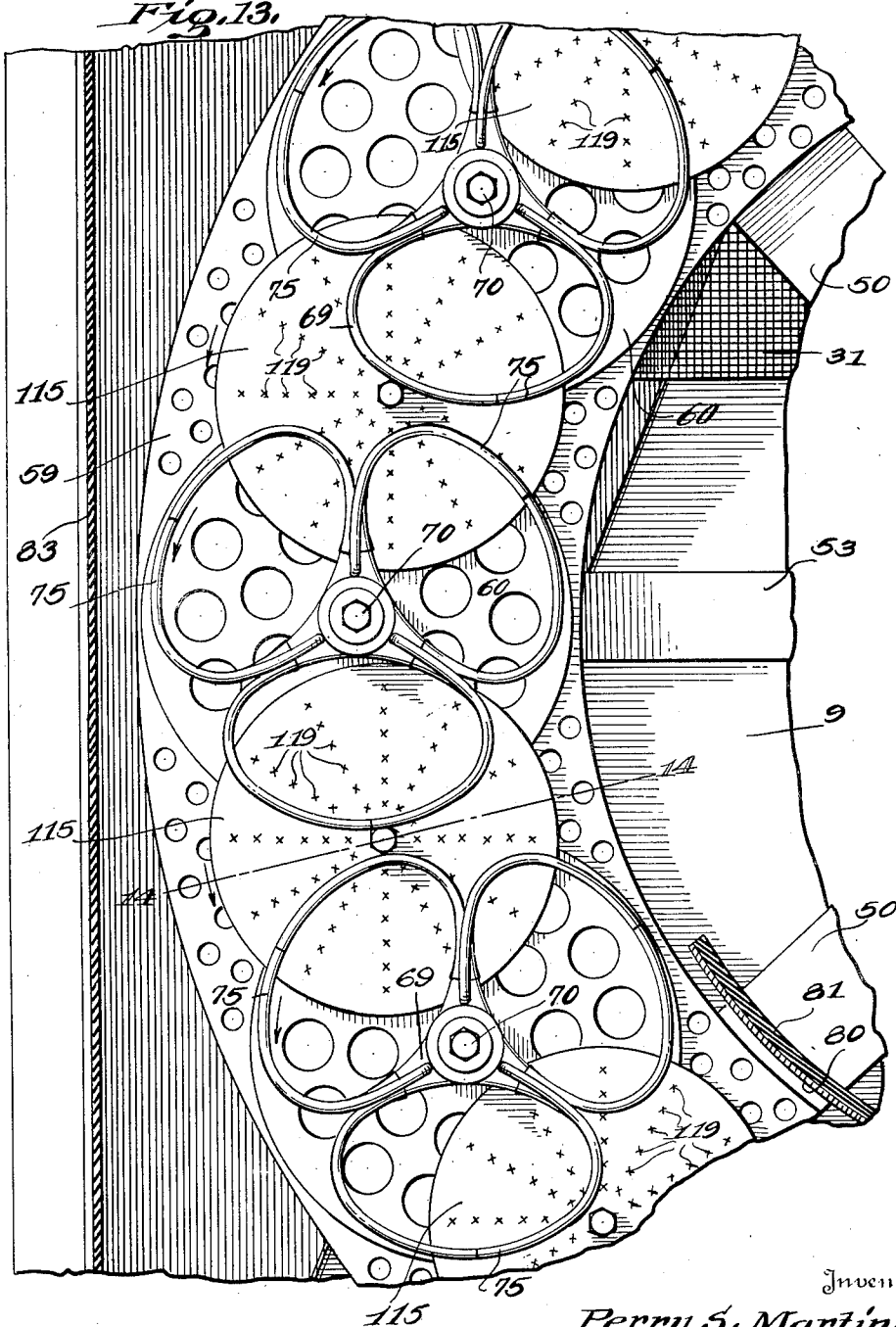
July 18, 1933. P. S. MARTIN 1,918,653

EGG CLEANING MACHINE

Filed July 27, 1929 10 Sheets-Sheet 10

Fig. 13.



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Patented July 18, 1933 1,918,653

UNITED STATES PATENT OFFICE

PERRY S. MARTIN, OF HARRISONBURG, VIRGINIA

EGG CLEANING MACHINE

Application filed July 27, 1929. Serial No. 381,561.

This invention relates to egg cleaning machines and the particular object of the invention is to improve upon that type of machine disclosed in my former Patent 1,596,285 granted August 17, 1926. In cleaning eggs by the method disclosed in that machine, i. e., by the sand blast method, it has been customary to remove in any suitable manner all lumpy or protruding foreign matter before the eggs are subjected to the sand blast. If this is carried out thoroughly so that only stains are left considerable time is required which naturally increases the cost of the cleaning operation. In the present machine I have designed mechanism constructed to remove by scraping a large portion of the lumpy or protruding foreign matter adhering to the eggs, thus making it necessary to only take off large particles before the eggs are placed in the machine and subjected to the sand blast. It is, therefore, an object of this invention to provide simple and efficient means for removing a major portion of the lumpy, foreign matter adhering to the eggs and which has not been previously scraped off by the knife of the operator. These foreign particles cannot be effectively removed by the sand blast because being of a hardness substantially equal to the hardness of the egg shell are only cut by the sand equal to the cutting of the egg and if the foreign matter is relatively thick, an operation to completely remove such foreign matter would cut the shell to such a degree that the egg could not be handled or if it could be handled, would not keep.

Another object of the invention is to provide mechanism which will effectively turn the eggs so that every portion of the egg is presented to the sand blast and effectively cleaned. Heretofore in machines of this character attempts have been made to effectively turn the eggs so as not only to present the sides of the eggs but also the ends to the sand blast, but so far as I know this has not been accomplished and in a great many instances the eggs are found to be dirty on their ends because of the fact that no means were provided for rotating the eggs endwise. Rotation of the eggs on their longitudinal axis only presents the sides of the eggs to the sand blast, and while the butts and points of the eggs are frequently exposed to the sand blast and partially cleaned, a great number of the eggs are dirty on their ends by reason of the failure of the machine to rotate the eggs on their transverse axis or minor axis. The present machine, therefore, has means which in addition to rotating the eggs on their longitudinal axis also rotates them on their transverse axis so that all surfaces of the egg are presented to the sand blast and effectively cleaned. Simultaneously with this sand blasting action the machine also tends to scrape off any protruding foreign substances which may have been left on the egg by the operator who scrapes off the larger particles.

Another object of this invention is the provision of simple and efficient means for effectively removing and discharging from the machine all dirt or foreign particles removed from the eggs and conducting the sand which has not been ground to dust by attrition to a reservoir where it can be elevated and dumped into the supply hopper, the sand being used over and over again until it has been reduced to such fineness that it is carried off with the dust and foreign matter from the machine.

Further objects of the invention will appear as the following specific description is read in connection with the accompanying drawings which form a part of this application, and in which

Fig. 1 is a front elevation;

Fig. 2 is a side elevation;

Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 1;

Figs. 4, 5 and 6 are horizontal sections taken on the lines 4—4, 5—5 and 6—6 of Fig. 3;

Fig. 7 is an enlarged detailed vertical section showing the driving connection to the egg table and from the circular rack to the egg holders;

Fig. 8 is an enlarged detailed view of one of the egg holders and its associated egg supporting plate and table;

Fig. 9 is a horizontal sectional view

through the gear box showing the arrangement of the reduction gears from the drive shaft to the driven shaft which actuates the table;

Fig. 10 is a vertical sectional view through this gear box;

Fig. 11 is a perspective view of one of the egg holders;

Fig. 12 shows a modified form of egg holder and scraping plate;

Fig. 13 is an enlarged plan view showing a modified form of egg support and scraping construction, and

Fig. 14 is a vertical sectional view taken on the line 14—14 of Fig. 13.

In the drawings the casing 1 is shown to be a rectangular box-like structure supported upon legs 2 above the floor or other surface and having a conical cover 3 secured to the top thereof in any suitable manner and provided with an opening 4 for the insertion of the eggs into the machine as will be clearly understood from what follows. The front wall of the casing is provided with an opening closed by a hinged door 5 which provides access to the motor and to the mechanism therein contained. The front of the casing is also provided with a switch box 6 whose control member 7 extends outside of the box for easy access thereto.

As shown in Fig. 3 the rear wall of the casing is provided with an opening 8 adjacent its lower end and extending diagonally across the interior of the casing from the front wall to the back is a diaphragm or partition member 9 which divides the casing into separate compartments 10 and 11 and which serves to conduct the sand from the blast apparatus to a receptacle 12 in the base of an elevator housing 13 arranged in the rear of the casing and extending vertically above the same, where it is provided with a discharge chute 14 communicating at its forward end with a hopper 15 secured to the conical cover 3. The hopper 15 extends down into the cover as shown in Fig. 3 and is provided with a conical bottom 16 having an outlet spout 17 controlled by a valve 18 slidably mounted in a spider 19 and in a closure member or top 20. The operating rod of the valve 18 projects above the top 20 where it has secured thereto a thumb nut 21 engaged by the yoke end of an operating lever 22, pivoted upon the top and actuated by handle member 23 slidably arranged in an apertured arm 24 extending from the top. As shown this handle member is provided with rack teeth 25 which are caused to engage one wall of the aperture in the arm 24 by a leaf spring 26 secured to said arm and normally pressing handle member in one direction. When the handle member is forced inwardly toward the hopper so as to disengage the teeth 25 from the arm it may be raised or lowered to elevate or depress the valve 18 and thus regulate the amount of sand discharged through the spout 17.

Arranged within the compartment 10 is an electric motor 27 having its armature shaft arranged vertically and projected through a fan housing 28 supported upon the casing in any suitable manner. Within the housing is an ordinary suction fan 29 and the housing is coupled to an intake pipe 30 extending through the partition 9 into the compartment 11 where it is provided with a depending end lying over a separating screen 31 through which the sand from the sand blast apparatus passes to the receptacle 12. The fan housing 28 is also connected as shown in Fig. 6 to a discharge pipe 32 which leads out of the rear wall of the casing to any suitable dust collector or may pass out of the building where the dust and dirt can be discharged into the open air.

Above the fan housing the armature shaft of the motor is provided with a pair of pulleys as shown in Fig. 3 indicated at 33 and 34 and constructed to be engaged by a driving belt 35 which extends around a pulley 36 of considerably greater size than the pulleys 33 or 34, and keyed to the upper end of the drive shaft 37 of the reducing gearing which will now be described.

The shaft 37 extends downwardly into the reducing gearing box 38 where it is journalled in a bracket 39 secured to the base of said box and is provided with spaced bearings between which the worm 40 keyed to the shaft 37 operates. This worm is in mesh with a worm wheel 41 keyed to the forward end of a shaft 42 extending at right angles to the shaft 37 in a horizontal plane and mounted in bearings 43 raised from the base of the gearing box. At the end of the shaft 42 opposite the worm wheel 41, there is secured a bevelled pinion 44 in mesh with a similar pinion 45 keyed to a vertical shaft 46 journalled in a step bearing in the reducing gearing box and in a packing gland 47 carried by the top of said box. This shaft extends upwardly through the partition 9 and carries on its upper end as shown in Fig. 7, a pinion 48 which meshes with and serves to drive the ring gear 49 carried by arms 50 radiating from a central bearing head 51 journalled on a collar bearing 52, secured to and projecting upwardly from the ring gear spider 53. This spider is mounted stationarily on a housing 54 supported upon the partition 9 as shown in Fig. 3. This housing is substantially triangular in side elevation and completely covers an opening 55 formed in the front wall of the partition 9 for a purpose to be hereinafter described. The ring gear spider 53 carries on the outer ends of its arms a ring gear 56 arranged to be engaged by pinions 57 on the lower ends of the egg carrier shafts 58 as will be presently understood.

As shown in Figs. 3, 4 and 7 there is mounted above the ring gear 49 an annular egg supporting table 59 provided with a plurality of apertures for a purpose to be presently explained, and on this table is mounted a series of foraminous frusto-conical discs 60, secured to the table in any suitable manner, such for instance as shown by rivets 61. These discs are centrally apertured as indicated at 62 in alignment with corresponding apertures 63 in the table and passing through these apertures are the egg carrier driving shafts 64 carrying the pinions 57 and the egg carriers 58. As shown in Fig. 7 the shafts 64 project through self-lubricating bearing bushings 65 fitted in the ring gear 49 and carrying upon their upper ends a felt dust washer 66 which is covered by a cap 67 for preventing ingress of dust, sand and like gritty matter to the bearing. On top of the cap 67 there is a felt or other suitable washer 68 and mounted on this is the egg carrier spider 69 which is secured to the shaft by a stud screw 70 as shown.

The egg carrier 58 embodies the spider 69 and a plurality of egg holders, preferably three in number, spaced equidistant around the spider and each comprising a pair of arcuate arms 71 arranged in opposition to each other and forming a substantially oval egg retaining element, with the shorter diameter radial to the axis of the spider and of less diameter than the longitudinal diameter of the average egg so as to generally prevent a complete reversal of the egg end for end when lying on its side. In other words, the construction of the retaining elements is such that the egg may have practically universal movement without completely turning in a horizontal plane but still permitting a complete end for end reversal in a vertical plane. The terminals of the arms 71 are separated as shown at 72 to permit of a protective covering 73 preferably in the form of a live rubber tube which resists the erosive action of the sand much more effectively than any now known substance. The arms 71 are preferably formed from relatively stiff and heavy wire whose inner terminals are secured to the spider 69 in any suitable manner as this form of egg carrier can be produced at a relatively low cost and permits of the convenient replacement of the rubber protective covering, but it will be understood that the carrier may be formed in any other suitable manner such for instance as die-stamping and the egg rings or holders covered with a protective sheath applied in any approved fashion, such for instance as coating the entire spider with live rubber or riveting strips thereto which project slightly beyond the metal edges. This protecting coating not only serves to prevent wear of the carrier but also serves as a cushioning element which effectively prevents or reduces the amount of breakage in the operation of the machine.

The spider 69 has resting upon the discharge surface thereof a head member 74 which has secured thereto a plurality of fingers 75 curved to conform to the curvature of the arms 71 and elevated above the same as shown in Figs. 7 and 11, by their vertical stems 76. These fingers are also made in any preferred manner, for instance as here shown, by relatively stiff wire and are protected against erosion in a manner similar to the arms 71, i. e. by live rubber tubes 77 which are threaded thereover and serve also to cushion the impact of the egg when turning on its transverse axis, that is, end for end as will be hereinafter explained. The stud bolt 70 passes through the head and into the shaft 64 so as to retain all parts in their proper relation and cause the egg carrier and guard fingers to rotate with said shaft.

As shown in Fig. 4 there are a series of such egg carriers arranged around the table and each is provided with a driving shaft extending through a bearing in the ring gear 49 and are geared to the ring gear 56 as shown in Figs. 3 and 7 so that as the table which moves with the ring gear 49 is rotated the egg carriers and their associated guard fingers will be caused to rotate in the direction of the arrows in Figs. 4, 5 and 8.

In order that the ring gear 56 and its associated pinions 57 may be protected from dust and sand to as great an extent as possible, I secure to the lower side of the ring gear 49 an annular deflecting strip 78 having a depending inner marginal edge 78 which overhangs the inner periphery of the ring gear 56 and therefore discharges any sand or dirt falling thereon inwardly of the periphery of the ring gear 56 and onto the partition 9 where it passes through the screen 31 or is removed from the casing by the suction fan 29. The point where the drive pinion 48 engages the ring gear 49 is partially protected from sand or dirt entering between these gears by the provision of a guard member 80 depending from the cover 3 across the opening 4. This guard member is arcuate in outline conforming to the curvature of the table 59 and is preferably lined throughout a portion of its inner surface with a protective covering 81 of live rubber or other similar material which is not subjected to such rapid erosion as metal would be. I also preferably line that portion of the cover that is exposed directly to the sand blast by a protective covering such as is indicated at 82 and this covering preferably depends over the joint between the casing and cover in the form of a skirt 83 which prevents sand and dirt from getting into the joint or being discharged between the casing and covering as will be readily understood.

Secured to the floor of the casing is a plat-

form member 84 upon which is mounted a bearing cup 85 having secured therein a lubricating housing 86 and also provided with a centrally arranged cone-shaped step bearing 87. The upper end of the housing is secured within a transverse web 88 bridged across the sides and vertical rear end of the housing 54. In the upper end of this lubricating housing 86 I secure a ball bearing 89 and mounted to rotate in this bearing and on the step bearing 87 is the impeller shaft 90 driven by the electric motor through belt 91 extending through the opening 55 in the partition 9. The belt 91 travels around pulleys 92 and 93 carried respectively by the upper end of the motor shaft and the impeller shaft 90. The housing 86 is preferably filled with a lubricating medium such as heavy oil or the like which is carried up to the bearing 89 by a spirally arranged rib 94 secured to the impeller shaft within the housing 86.

The impeller is secured to the upper end of the impeller shaft 90 and is generally indicated at 95. This impeller is located immediately beneath the discharge spout of the hopper 15 and comprises generally a hollow head constructed in two halves 96 and 97, the latter of which is provided with a centrally apertured collar to receive the impeller shaft 90 and is secured to such shaft by a set screw 98. The upper half is preferably bolted to the lower half and is provided with a central opening so as to receive sand from the hopper as will be clearly understood from an inspection of Fig. 3. Each of these halves is provided with four semicircular grooves disposed radially which mate to form circular openings for receiving the radiating impeller arms 99. Each groove is provided with a semicircular recess 100 which when the upper and lower halves are joined provides a circular recess for receiving an annular rib 101 formed on the inner end of the impeller arms, whereby the tubes may be rotated for a purpose to be hereinafter described. Each impeller arm has its outer end provided with an inwardly extending flange 102 providing a central discharge opening 103 and also a retaining means for the lining tube 104. These lining tubes are preferably constructed of live rubber and open at their inner ends into the central compartment 105 into which the sand is discharged from the hopper, and each has a bore which is uniform in diameter throughout its length so as to prevent sand from packing therein.

As will be noticed from an inspection of Fig. 7 the discharge from the impeller arms is in a direct line with the longitudinal axis of an egg when lying on its side and slightly above the arm 71 of the egg carrier so that as the egg is rotated on the frusto-conical platforms 60 carried by the table the sand blast will be brought into contact with all portions of the egg and the stains and dirt effectively removed therefrom.

As will be readily understood the impeller is rotated at a high rate of speed so that the sand deposited in the central compartment 105 is thrown outwardly by centrifugal action with great force against the eggs. As will be noted from an inspection of Figs. 4 and 7, the eggs in the carrier members will be subjected to varying degrees of intensity of the sand blast due to the fact that at times an egg is closer to the discharge end of the impeller arms than at other times. As this sand blast is ejected from the impeller arms it strikes the egg nearest to the discharge end of said arms in a stream quite narrow as to its vertical dimensions and with considerable force and then spreading out in the manner of shot from a shot-gun dissipates its force but covers a larger area on the eggs furthest removed from the discharge end of the impeller arms. The maximum force of contact of this sand stream serves not only to remove large lumps of foreign matter, but serves in connection with the friction developed by pulling the egg over the stationary plate 60 to insure the turning of the egg end for end in a vertical plane and this is brought about largely by reason of the fact that one end of the egg is presented to the maximum intensity of the sand blast at a time when the egg is starting to move out of the zone of maximum intensity. In this connection, it will be noted that the friction generated on the egg by moving it across the stationary plate in the direction of the arrow in Fig. 4 has a tendency to turn the egg end for end in a vertical plane and this tendency is assisted by the sand blast which has sufficient force to complete the operation. It will be further noticed that in turning the egg end for end the side which has been lying upon the plate 60 is then exposed to the sand blast. Repeated end for end turnings during the passage of the egg from the loading point to the unloading point exposes not only all sides but both ends of the egg constantly to varying degrees of attrition which effectively removes all foreign matter and stains without permitting any portion of the surface of the egg to be subjected to the maximum force of the sand blast, sufficiently to weaken or destroy the shell. The sand then falls onto the inclined surface of the partition and passes downwardly through the screen 31 into the receptacle 12 where it is again elevated in any suitable manner and redeposited in the hopper 15. I have shown an ordinary bucket elevator 106 which dips into the receptacle and discharges the contents of its buckets into the chute 14. This elevator as shown in Fig. 2 is driven by an auxiliary motor 107 mounted upon a platform 108 secured to the rear wall of the casing and

belted to a pulley 109 on the upper shaft 110 of the bucket conveyor. This motor is preferably connected in multiple with the circuit of the motor 27 and the switch 7 so that both are started and stopped simultaneously under control of the single switch.

While the screen 31 is usually sufficient to catch all large particles, I also preferably provide a second screen 111 carried by a bridge piece 112 extending across the hopper 15. This screen is arranged in the path of the discharge from the spout 14 so that any particles passing the screen 31 will be caught and retained therein thus insuring clean sand being deposited in the hopper from the elevator. By removing all large particles and insuring a supply of clean sand to the impeller I prevent the stoppage of the tubes 104 with the result that an even and uniform discharge is always obtained.

In applicant's previous Patent 1,505,484, after the initial use of the sand in cleaning it was carried upwardly through a separating screen into the hopper and the fine matter and dust was carried out through a second finer screen to a discharge stack. This was accomplished by a blast of air generated by the impeller. This construction, of course, was faulty due to the fact that large particles of foreign matter removed from the eggs could not pass either screen and were kept constantly moving back and forth in the air stream or clogged the screen to such an extent that no cleaning of the sand could be obtained. With the present construction, the sand immediately after being used is conducted down the inclined partition 9 to a separating screen where the larger particles are permitted to pass to the hopper or receptacle 12. The finer particles or dust and the foreign matter are removed by the suction fan through the tube 30 terminating immediately above the screen. This insures at all times a supply of clean cutting sand being conducted to the hopper 15. This foreign matter removed by the suction fan is taken out of the machine and discharged through the stack 32 and before it reaches the hopper.

In the form of the invention disclosed in Fig. 8, the platforms 60 are shown to be provided with a plurality of holes 113 which are preferably punched out on a punch press and the burrs left projecting from the upper surface so as to effect a scraping action on the eggs as they are dragged over these platforms by the rotation of the egg carrier. In the form of the invention shown in Fig. 12 a slightly different arrangement has been shown in which the platforms are provided with a plurality of slots 114 radiating from the center and with gradually diverging walls. These slots are also preferably made on a punch press so as to leave the burrs on the edges for a scraping action.

In order to obtain an additional scraping action on the eggs, I can if desired mount upon the table between each platform a disc 115 such for instance as is shown in Figs. 13 and 14, and which is caused to rotate in a manner similar to the egg carrier drive. That is, by having each of these discs connected to a shaft 116 extending through lubricating bearings 117 carried by the ring gear 49 and provided with pinions 118 meshing with the ring gear 56. These discs are preferably provided with punched-up burrs 119 produced in any suitable manner, such for instance as breaking through the metal with a center punch or the like. It will also be understood that the discs may have a roughened surface produced in any suitable manner just so it is calculated to cause a scraping action on the eggs for removing such foreign protuberances as have escaped the operator's scraping knife.

In addition to the guard 80 which extends across the opening 4, I also provide the machine with partition plates 120 extending from the guard to the forward wall of the cover 3 and having depending from their lower edges fringed guard strips 121 which, with the plates 120, effectively prevent any dust or other foreign matter finding exit through the opening 4 to the annoyance of the operator. The fringed ends of the strips as shown in Fig. 3 practically contact with the top surface of the table and are kicked out of the way by the egg carriers as they travel around across the opening 4.

In the operation of the machine a suitable quantity of sand, preferably clean white sand, is placed in the hopper and the valve 18 raised a sufficient distance to regulate the amount of discharge through the spout 17. The motors 27 and 107 are then started which causes not only a rotation of the impeller shaft (I prefer to rotate the impeller at about 1800 revolutions per minute) but also through the reducing gearing and the driving shaft 46 rotates the ring gear 49 carrying with it the table 59 and its associated egg carriers. As the ring gear rotates the shafts 64 also rotate on their own axis by reason of the engagement of the pinions 57 with the ring gear 56 which is stationary. As the carriers pass the opening 4 the operator places three eggs in each carrier, one for each oval holder, and as these carriers emerge from beneath the fringed strips or aprons 121, the cleaned eggs are removed. As the eggs are placed in each one of the holders of the egg carrier, their tendency is to roll to the outside of such holder due to the inclination of the platform 60 but as the eggs roll better when turned on their longitudinal axes and are being moved over the platform by the rotation of the carrier, they will change their positions frequently during the passage around the circuit, sometimes presenting a

side to the outer portion of the holder and at other times presenting one end. The impeller being rotated at a high rate of speed and discharging sand radially with considerable force against the eggs produces a peculiar effect in the movement of the eggs and produces a tendency for the egg to move inwardly toward the axis of the carrier against the inclination of the platform. Under these opposing forces, i. e. the force of gravity and the opposing force of the sand blast when coupled with the friction of the platform, causes the egg to turn end for end on a transverse axis and then to roll down the platform to the outer side of the holder again where being caught by one of the edges of the openings may be turned to roll with its longitudinal axis substantially radial to the axis of the carrier or to again roll with its transverse axis radial to the axis of the carrier. In fact the egg under the opposing forces of gravity and the sand blast and the frictional engagement of the platform rolls in all directions and therefore presents all surfaces to the sand discharged from the impeller. This rolling of the egg in practically all directions is noticeable to a slight degree while the egg is passing in front of the guard 80 and not subjected to the sand blast and this is due I believe largely to the friction of the platform and the inclination thereof but the universal rotation of the egg is very pronounced when subjected to the sand blast after it passes beyond the protection of the guard.

The eggs in their passage around the axis of the carrier over the platform not only rotate on practically every axis but are frictionally slid bodily over the platform thereby producing a scraping action which the edges of the openings accentuate, which scraping action serves to remove any large protruding particles adhering to the eggs so that the sand blast can effectively remove the stains and discolorations.

While I prefer to use the type of platform disclosed in Figs. 4, 7 and 8, I may also use the type of platform disclosed in Fig. 12 with the radial slots which produces a very effective scraping action and which materially aids in the end turning of the eggs. It will also be understood that any platform having a roughened surface can be utilized but I prefer one that has openings so that the sand can pass therethrough and not accumulate so as to get in the bearings of the egg carriers. The table 59 is also preferably made foraminous so that sand deposited thereon will find free access to the partition 9 where it passes through the screen into the receptacle 12. It will be noted from an inspection of Figs. 3, 5 and 6 that the partition not only extends from the front to the rear wall of the casing, but also from the side walls inwardly and thus forms a funnel which guides the used sand to the opening 8.

In some instances I find it desirable to employ the additional scraping plates 115 rotated through their connection with the ring gear 56 and in the same direction as the rotation of the egg carriers. With this arrangement when the eggs are moved in the circular path around the axis of the egg carrier they will be first moved over the platform and then ride up on the disc 115 which at that point is moving in a direction opposite to the movement of the egg and thus produces a very active scraping effect to remove any large particles adhering thereto. As the egg generally has its transverse axis radial to the axis of the carrier when it rides up on the disc 115 and is engaged by the burrs 119, it is turned on this transverse axis so that the opposite end is presented to the sand blast and effectively cleaned.

As will be noticed from an inspection of Fig. 7 the carrier arms are slightly below the center of the transverse diameter of the egg when lying on its side or in other words raised above the platform slightly less than half the transverse diameter of the egg so that there is no obstacle in the path of the sand blast. To obtain this result, however, and the end for end turning of the egg, it is important that the guard fingers 75 be employed to prevent the egg from riding over the carrier arms and dropping off the table. These guard fingers are raised a sufficient distance above the carrier arms as will be seen from an inspection of Fig. 7, to prevent such riding-over action and serve to effectively hold the egg when so turned within the confines of the carrier arms.

While I have described effective means for regulating the supply of sand to the impeller depending upon the speed of this element, any suitable means may be employed for this purpose as is well understood. Furthermore, I wish it understood that while 1800 revolutions per minute is the preferable speed at which the impeller should rotate, I may readily increase or decrease this speed by changing the size of the pulleys 92 and 93. By shifting the belt 35 from the relatively large pulley 34 to the smaller 33 on the motor shaft, I may further reduce the speed of the drive shaft 46 beyond the reduction afforded by the reduction gearing in the gear box 38 and if the eggs are extremely dirty or have heavy stains, I find that a slower speed of the table will produce a more effective cleaning due to the fact that the eggs are subjected to the sand blast for a longer period of time.

When it is desired to put fresh sand into the hopper the nut 21 is removed from the valve rod and the cover 20 bodily removed, the valve dropping by gravity so as to prevent overflow of the chamber 105 in the impeller. I also wish it understood that the

screens 30 and 111 are preferably mounted so as to be conveniently removed when necessary for cleaning or replacement and that the egg carriers and associated fingers are so constructed and attached to their drive shafts that they may be readily removed and the worn coverings may be easily replaced.

It will be noted that as the impeller travels in a clockwise direction as indicated by the arrow in Fig. 4 that the inertia of the sand in travelling through the impeller arms causes it to impinge against the rear side of the lining tubes 104 which side, of course, receives the maximum wear. By constructing the impeller head as described of two halves, these tubes and arms may be rotated to bring fresh surfaces into play, thus lengthening the useful life of such lining tubes. It will also be noticed that the impeller arms may be readily removed and replaced or new tubes inserted therein by simply disconnecting the upper and lower halves of the head.

What I claim is:

1. In an egg cleaning machine, a rotatably mounted table, and means for rotating the same on a predetermined axis, means for moving eggs across said table in a circular path independent of the table axis, means normally acting to cause gravitation of the eggs away from their axis of movement, and means for directing a sand blast against said eggs which acts when said eggs are nearest to the table axis to counteract the action of gravity.

2. In an egg cleaning machine, a movable egg supporting table, egg retaining means rotatably mounted upon the table, means for rotating the same to roll the eggs, and an inclined plate acting upon the eggs to change the position of the longitudinal axis of the egg.

3. In an egg cleaning machine, a table, rotatable egg retaining means mounted on the table, a plate secured to the table and inclined toward the axis of the retaining means, said retaining means when rotated adapted to move the eggs over said plate and to cooperate therewith to change the axis of rotation of the eggs, and means for holding the eggs in said retainer upon rotation of the eggs on a transverse axis in a vertical plane.

4. In an egg cleaning machine, a table, a device carried by and rotatable above the table and comprising a plurality of egg receiving loops, means for rotating said device to roll the eggs in a circular path on said table, and a perforated plate carried by the table and inclined toward the axis of said device for supporting the eggs within said loops and normally tending to gravitate the eggs toward the outer side of said loop.

5. In an egg cleaning machine, a table, a device carried by and rotatable above the table and comprising a plurality of egg receiving loops, means for rotating said device to roll the eggs in a circular path on said table, a perforated plate carried by the table and inclined toward the axis of said device for supporting the eggs within said loops and normally tending to gravitate the eggs toward the outer side of said loop, said plate cooperating with the loops to cause an endwise turning of the eggs, and means for preventing escape of the eggs from the loop when turned endwise.

6. In an egg cleaning machine, a table, a device carried by and rotatable above the table and comprising a plurality of egg receiving loops, means for rotating said device to roll the eggs in a circular path on said table, a perforated plate carried by the table and inclined toward the axis of said device for supporting the eggs within said loops and normally tending to gravitate the eggs toward the outer side of said loop, said plate cooperating with the loops to cause an endwise turning of the eggs, means for preventing escape of the eggs from the loop when turned endwise, means for rotating said table, and means for directing a sand blast on the eggs as the table is rotated.

7. In an egg cleaning machine an egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device mounted to rotate on its own axis above said support and having means at a distance from its axis to move an egg orbitally about the axis of said device in frictional engagement with said support, means for causing the egg moving device to travel bodily in a given path, and means for subjecting the eggs on the support to a cleaning medium.

8. In an egg cleaning machine a rotatable egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device mounted to rotate on its own axis above said support and having means at a distance from its axis to move an egg orbitally about the axis of said device in frictional engagement with said support, means for causing the egg moving device to travel bodily in a given path, and means for subjecting the eggs on the support to a cleaning medium.

9. In an egg cleaning machine a movable support having horizontal portions for frictionally engaging and supporting the eggs, a series of egg moving devices carried by said support and movable bodily therewith each rotatable on its own axis and provided with egg engaging means at a distance from said axis, to move the eggs in frictional engagement with said support orbitally about the axis of said devices, means for causing the egg moving devices to travel bodily in a given path, and means for subjecting the eggs in said devices to a cleaning medium.

10. In an egg cleaning machine a rotatable support provided with a horizontal supporting surface for engaging and supporting the

eggs, a circular series of egg moving devices carried by and movable bodily with said support and each rotatable on its own axis each of said devices having egg engaging parts at a distance from its axis of rotation, to move the eggs over said support orbitally about the axis of said devices, and means for subjecting the eggs in said devices to a cleaning medium.

11. In an egg cleaning machine, a supporting table provided with a horizontal supporting surface for engaging and supporting the eggs, means for moving said table in a fixed path, a series of rotatable egg carriers arranged above the table, each provided with engaging means located at a distance from its axis of rotation for moving the eggs in said carriers in a circular path across said table in frictional contact therewith, orbitally about the axis of the carrier, and means normally acting to move said eggs away in a direction from their axis of movement.

12. In an egg cleaning machine a rotatably mounted table, means for moving eggs over said table in a circular path independent of the path of movement of the table and orbitally with respect to the axis of the moving means, and means for directing a cleaning medium on the eggs together with means normally acting to move the eggs away from the axis of said moving means.

13. In an egg cleaning machine a rotatably mounted table, means for moving eggs over said table in a circular path independent of the path of movement of the table and orbitally with respect to the axis of the moving means, means normally tending to move the eggs away from the axis of said moving means, and means for directing a cleaning medium on the eggs operating to narrow the circle of movement of said eggs and bring them closer to the axis of the moving means.

14. In an egg moving unit for egg cleaning machines, a rotating member, an egg retaining element carried thereby substantially oval in shape and having its major axis perpendicular to a radius from the axis of the rotating member and a second retaining element carried by the rotating member and arranged above the first, said retaining elements being arranged above and below the longitudinal axis of the egg when supported for movement by said egg moving unit.

15. In a unit for egg cleaning machines, the combination with a support, a rotating member arranged above said support, an egg retaining element carried by said rotating member at a point below the longitudinal axis of the egg when lying on said support, a second retaining element carried by said rotating member and arranged above the longitudinal axis of the egg when lying on said support together with means for rotating said member.

16. An egg moving unit for egg cleaning machines comprising a rotating member and a plurality of egg retaining elements arranged at spaced intervals around said member and each comprising oval shaped elements having their maximum diameter perpendicular to a radius from the axis of said rotating member and their smaller diameter less than the major diameter of the average hen's egg, and a semi-oval retaining element carried by the rotating member and superposed above the oval retaining element to prevent escape of the egg upon end for end turning in a vertical plane.

17. In an egg cleaning machine, an egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device above said support movable bodily in a fixed path and rotatable about its own axis, said device provided at a distance from its axis with egg engaging means for holding the eggs with their major axes perpendicular to a radius from the axis of said device, and means for subjecting the eggs to a cleaning medium.

18. In an egg cleaning machine, an egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device above said support movable bodily in a fixed path and rotatable about its own axis, said device provided at a distance from its axis with egg engaging means for holding the eggs with their major axes perpendicular to a radius from the axis of said device, said egg engaging means being located at such a distance above the support as to engage the eggs below the plane of their longitudinal axes, and means for subjecting the eggs to a cleaning medium.

19. In an egg cleaning machine, an egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device above said support movable bodily in a fixed path and rotatable about its own axis, said device provided at a distance from its axis with egg engaging means for holding the eggs with their major axes perpendicular to a radius from the axis of said device, said egg engaging means being located at such a distance above the support as to engage the eggs below the plane of their longitudinal axes, means arranged above the plane of the longitudinal axis of the egg to prevent dislodgment of the egg when turned on a transverse axis end for end, and means for subjecting the eggs to a cleaning medium.

20. In an egg cleaning machine, an egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device above said support movable bodily in a fixed path and rotatable about its own axis, said device provided at a distance from its axis with egg engaging means for holding the eggs with their major

axes perpendicular to a radius from the axis of said device, said egg engaging means being located at such a distance above the support as to engage the eggs below the plane of their longitudinal axes, and means for subjecting the eggs to a horizontal blast of cleaning medium at one side of the line of bodily travel of the egg moving devices.

21. In an egg cleaning machine, an egg support having horizontal portions for frictionally engaging and supporting the eggs, an egg moving device above said support movable bodily in a fixed path and rotatable about its own axis, said device provided at a distance from its axis with egg engaging means for holding the eggs with their major axes perpendicular to a radius from the axis of said device, said egg engaging means being located at such a distance above the support as to engage the eggs below the plane of their centers, and means for subjecting the eggs to a horizontal blast of a cleaning medium projected from one side of the travel of the egg moving devices.

22. In an egg cleaning machine, a circular egg supporting table, means for moving said table about its own axis, a plurality of egg moving devices above the table arranged in a circular series and each movable about its own axis, said egg moving devices provided with retaining means for holding a series of eggs with their longitudinal axis perpendicular to a radius from the egg moving device, said retaining means being located at such distance above the supporting table as to engage the eggs below the plane of their longitudinal axes, guard members carried by said egg moving devices for preventing dislodgement of the egg from said retaining means when turned on a transverse axis end for end, and means for directing a blast of a cleaning medium horizontally against said eggs between the retaining means and said guards.

23. In an egg cleaning machine, a rotary egg moving device provided with a series of radially disposed egg retaining elements having substantially oval openings with their longitudinal axes perpendicular to the axis of the rotary egg moving device, and a roughened shell engaging support over which the eggs are moved when held in said retaining means to remove projecting particles adhering to the shell.

24. In an egg cleaning machine, a rotary egg moving device provided with a series of radially disposed egg retaining elements having substantially oval openings with their longitudinal axes perpendicular to the axis of the rotary egg moving device, and a roughened shell engaging support for the eggs inclined downwardly and outwardly from the axis of the rotating device and adapted to remove projecting particles adhering to the shell.

25. In an egg cleaning machine, a movable table having a supporting surface, egg moving devices above the table, movable bodily therewith and rotatable with respect thereto and provided with means for holding the eggs with their major axes in vertical planes substantially perpendicular to radii of said egg moving devices while permitting rotation of the eggs upon their major and minor axes with respect to said egg moving devices, by frictional engagement with the supporting surface of the table, and means for directing a stream of cleaning medium against said eggs in a direction to assist in effecting the end over end rotation thereof upon their minor axes.

26. In an egg cleaning machine, a movable table having a supporting surface, egg moving devices above the table, movable bodily therewith and rotatable with respect thereto and provided with means for holding the eggs with their major axes in vertical planes substantially perpendicular to radii of said egg moving devices while permitting rotation of the eggs upon their major and minor axes with respect to said egg moving devices, by frictional engagement with the supporting surface of the table, and inclined friction faces located on the supporting surface of said table, in the path of eggs moved by said egg moving devices, and co-operating therewith to vary the rotation of the eggs from one axis to another substantially perpendicular thereto, and means for directing a stream of cleaning medium upon the eggs engaged by said egg moving devices.

27. In an egg cleaning machine, a movable table having a supporting surface, egg moving devices above the table, movable bodily therewith and rotatable with respect thereto and provided with means for holding the eggs with their major axes in vertical planes substantially perpendicular to radii of said egg moving devices while permitting rotation of the eggs upon their major and minor axes with respect to said egg moving devices, by frictional engagement with the supporting surface of the table, means for directing a sand blast directed across a portion only of the table, and means for moving the table to bring the rotatable egg moving devices successively into the path of said sand blast.

28. In an egg cleaning machine, a movable table having a supporting surface, egg moving devices above the table, movable bodily therewith and rotatable with respect thereto and provided with means for holding the eggs with their major axes in vertical planes substantially perpendicular to radii of said egg moving devices while permitting rotation of the eggs upon their major and minor axes with respect to said egg moving devices, by frictional engagement with the supporting surface of the table, means for directing a sand blast directed across a portion only

of the table, and means for moving the table to bring the rotatable egg moving devices successively into the path of said sand blast, each of said rotary egg moving devices being provided with retaining means, adjacent to each egg moving portions thereof and in a different horizontal plane from said egg moving portions, to prevent the escape of the eggs therefrom when rotating on their minor axes.

29. In an egg cleaning machine, a movable table having a supporting surface, egg moving devices above the table, movable bodily therewith and rotatable with respect thereto and provided with means for holding the eggs with their major axes in vertical planes substantially perpendicular to radii of said egg moving devices while permitting rotation of the eggs upon their major and minor axes with respect to said egg moving devices, by frictional engagement with the supporting surfaces of the table, means for directing a sand blast directed across a portion only of the table, and means for moving the table to bring the rotatable egg moving devices successively into the path of said sand blast, each of said rotary egg moving devices being provided with egg engaging loops having their minor diameters less than the major axes of the eggs, and having a curved hook member above each loop to prevent the escape of the eggs when rotating on their minor axes.

PERRY S. MARTIN.