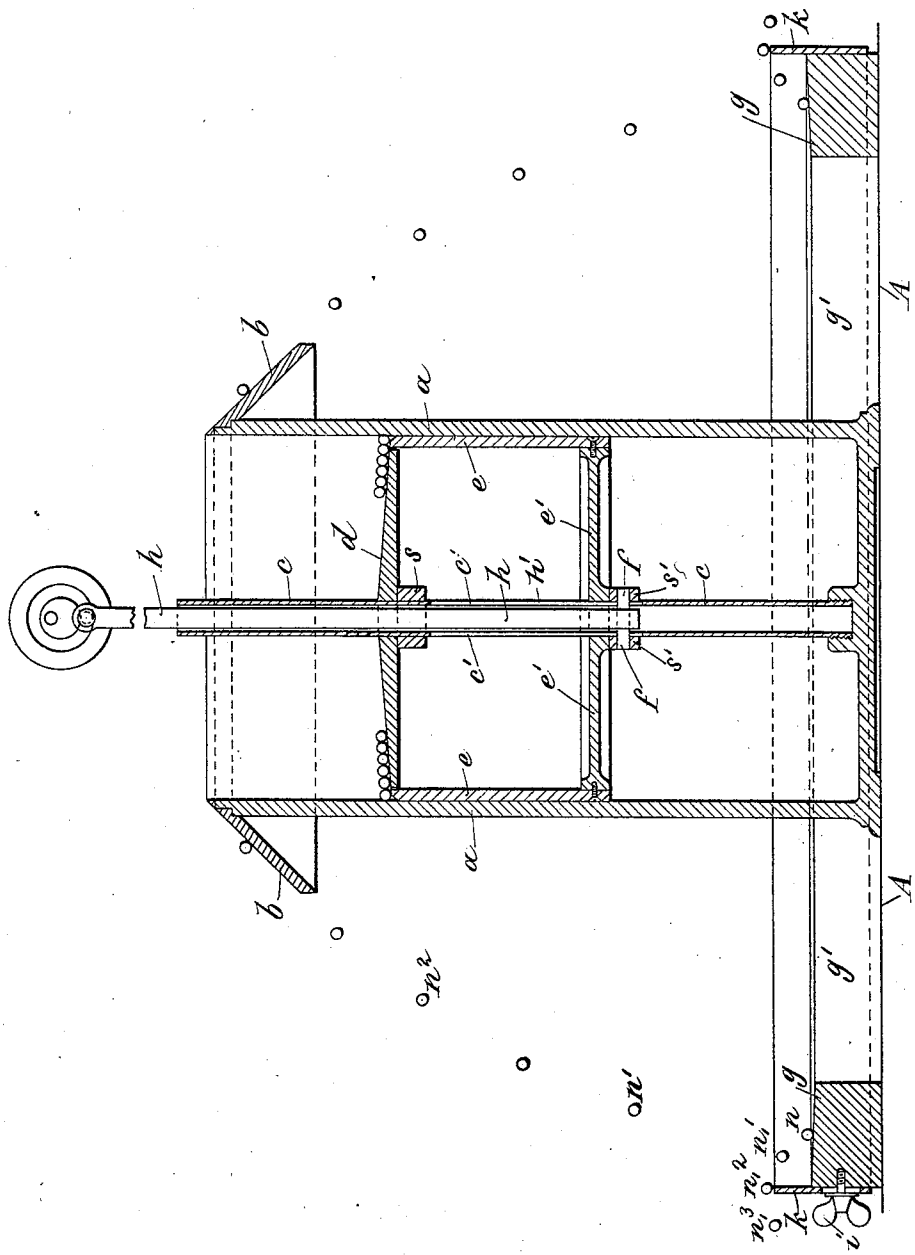
No. 643,912. Patented Feb. 20, 1900.

F. SCHUNK.

MACHINE FOR SORTING STEEL BALLS.

(Application filed Jan. 19, 1898.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

FRIEDRICH SCHUNK, OF SCHWEINFURT, GERMANY.

MACHINE FOR SORTING STEEL BALLS.

SPECIFICATION forming part of Letters Patent No. 643,912, dated February 20, 1900.

Application filed January 19, 1898. Serial No. 667,172. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH SCHUNK, engineer, of 9½ Anden Schanzen, Schweinfurt, Bavaria, German Empire, have invented a new and useful Machine for the Sorting of Steel Balls According to Quality, of which the following is a specification.

This invention relates to a machine for the sorting of the ready ground and hardened steel balls according to quality, which prevents cracked balls from being passed as perfect.

Hitherto it was tried to sort out the cracked balls, which cannot be avoided even by using best-quality steel, by skilful workmen examining each ball by help of a magnifying-glass. This entails a great amount of work and time and is, after all, not reliable, as very often the cracks are very fine and not easy to detect even by a magnifying-glass, so that in spite of the great care used many faulty balls were sold and caused great inconveniences in being used for cycles. Besides, the nature of the steel must necessarily cause unevenness in the hardening of large quantities of balls and makes the equal use of all balls impossible. To prevent these faulty balls from being passed as perfect, I have invented the above-mentioned machine, which is illustrated on the accompanying sheet of drawings by a sectional elevation.

On a very evenly planed table A is a strong partially-perforated circular case or shaft *a*, of cast-iron, on the top of which is put a very cleanly finished conical ring *b*, made of best steel and ending at the top in a sharp edge. Into the bottom of the case *a* is screwed the hollow axle *c*, which serves to receive the connecting-rod *h*. Onto the fixed axle *c* is fastened the fixed bottom *d* by means of the steel ring *s*. Between bottom *d* and the outer mantle of the shaft is an annular space, through which, fitting quite closely, can be moved to and fro a plunger or elevator cylinder *e*, which is connected by its bottom *e'* and the steel ring *s'* with the connecting-rod *h* in such a manner that a pin *f* connects the steel ring *s'* with the connecting-rod *h*. This pin is movable to and fro in a slit *c'* of the hollow axle. The outer ring of the plunger or elevator cylinder *e* slopes a little downwardly on its upper edge.

The connecting-rod *h* is moved up and down by any suitable contrivance, so that the upper sloping rim of the cylinder *e*, which moves simultaneously with it, rises just a little above the sharp edge of the cone *b*.

A further chief part of the machine is an accurately-finished steel ring *g*, of suitable size, worked out of best material and hardened, which is arranged concentrically around the shaft *a*. On this ring *g* and also worked of best material and well finished is a ring *k*, which is adjustable vertically by thumbscrews *i*, passing through slot *h'*. The upper edge of ring *k* rises above ring *g*.

The working of the machine is based on purely physical laws, especially the law relating to the rebound of elastic objects.

The bottom or support *d* remains stationary, and when the elevator *e* at its top registers with the upper surface of the bottom, as shown in the drawing, an annular row of balls will pass outwardly from the sloping top of the support *d* to the similarly-sloping top of the cylindrical or annular elevator *e*. The elevator then moving upward, said row of balls will be raised until it rolls off the incline or slope *b*. The outward slope at the top of the elevator will prevent the balls from dropping back upon the support *d*. The balls remaining on said support will roll downward toward the periphery thereof, engaging the inner surface of the cylindrical elevator *e*, and thus being in readiness to pass upon the top surface of the elevator as soon as the same is again lowered into the position shown in the drawing. The balls in rolling off the slope *b* receive an initial velocity, which causes them to describe a parabolic trajectory $n^2\,n'$ *n*, which is practically independent of the quality of the balls—that is, good balls and defective balls will follow the same path until they strike the ring *g*, which forms a base or impact-surface. The balls then rebound from said impact-surface, and those having the required degree of elasticity will clear the stop or barrier formed by the ring *k*, as indicated by the trajectory $n\,n'\,n^2\,n^3$, while balls which owing to defects in hardness or homogeneousness have an inferior degree of elasticity will strike the said barrier and fall back into the central space *g'*, surrounded by the ring or base *g*. To facilitate such move-

ment of the balls rebounding from the barrier *k*, the inner periphery of the base *g* may slope downward, as shown. Thus the defective balls will be collected in the central space *g'*, while balls fulfilling the requirements will be found on the outside of the ring or barrier *k*.

It will be understood that each time the elevator or plunger *e* is at the end of its downstroke a circular row of balls will automatically pass from the stationary support *d* onto the elevator, and at the end of each upstroke the circular row of balls will roll off the inclined top of the elevator onto the incline or slope *b*, surrounding the top of the elevator-shaft *a*.

This invention has so many apparent advantages that it is needless to dwell upon them. Its cheapness of construction and absolute uniformity of working and thorough reliability must recommend themselves to everybody.

Of course it does not interfere with the nature of the invention if a straight form is substituted instead of the round one, as shown above.

Having clearly explained the nature of the above invention, I now proceed to state that what I claim is—

1. The combination of the stationary support having a top surface sloping downwardly toward its outer edge, the elevator surrounding said support and having a top surface adapted to register with said sloping top of the support, the elevator-shaft surrounding the elevator, the annular slope or incline extending outwardly and downwardly from the upper end of the elevator-shaft, and means for sorting the bodies raised by the elevator and rolling off said incline.

2. The combination of the stationary support having a top surface sloping downwardly toward its outer edge, the elevator surrounding said support and having an inclined top surface whose inner, higher edge is adapted to register with the outer, lower edge of the stationary support, the elevator-shaft surrounding the elevator and engaging the same at the outer, lower edge of its inclined top surface, the annular slope or incline extending outwardly and downwardly from the upper end of the elevator-shaft, and means for sorting the bodies raised by the elevator and rolling off said incline.

3. The combination of the stationary central support having a top surface inclined downwardly toward its periphery, the elevator surrounding the said support, the elevator-shaft in which the elevator is adapted to move, the incline sloping downwardly and outwardly from the upper end of the elevator-shaft, and means for sorting the bodies raised by the elevator and rolling off said incline.

In witness whereof I have hereunto set my hand in presence of two witnesses.

FRIEDRICH SCHUNK.

Witnesses:
KARL WALLACH,
LUDWIG RÖSSLER.