

W. H. NORDHAUS.
CAN TESTING APPARATUS.
APPLICATION FILED MAY 26, 1906.

937,540.

Patented Oct. 19, 1909.

4 SHEETS—SHEET 1.

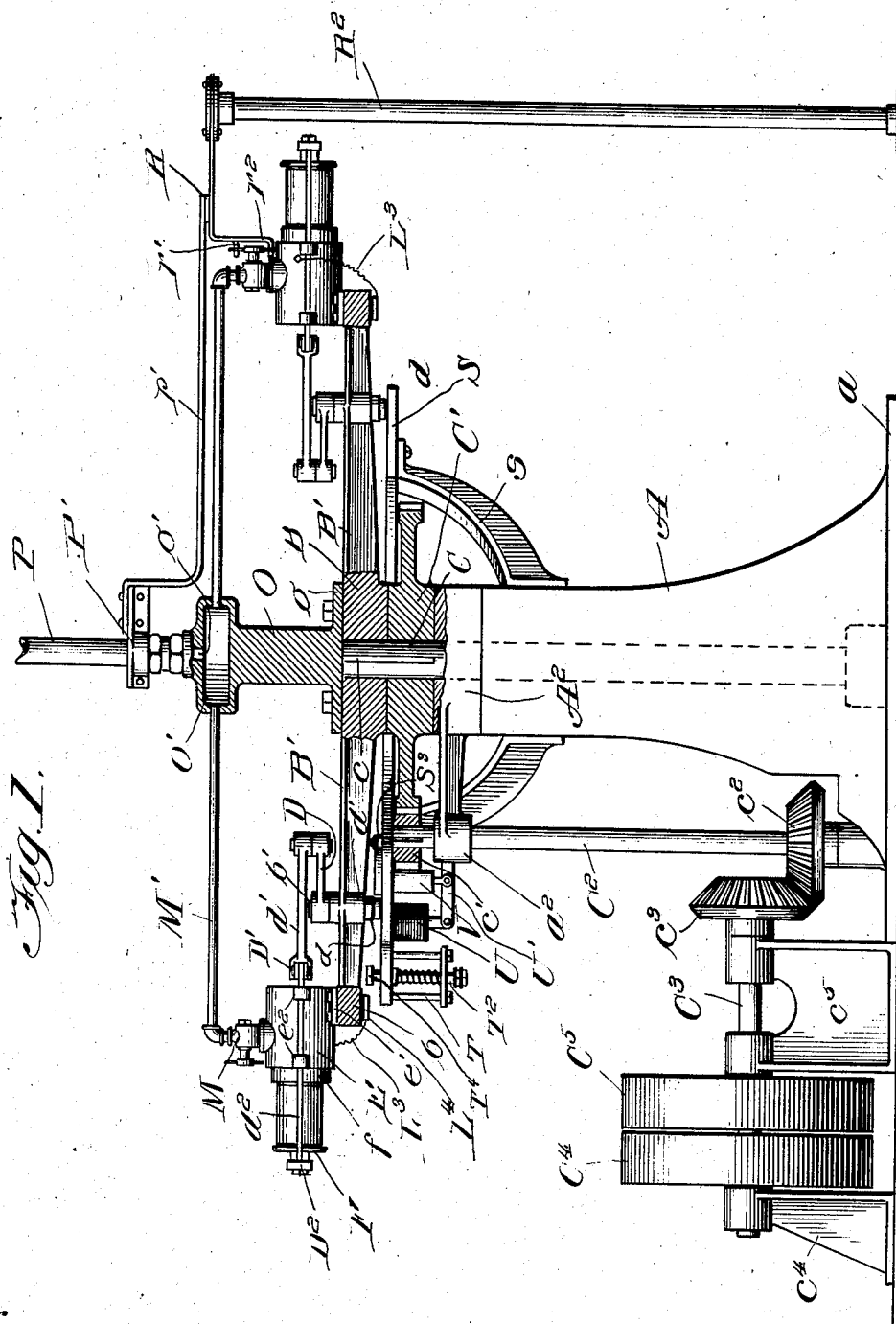


Fig. 1.

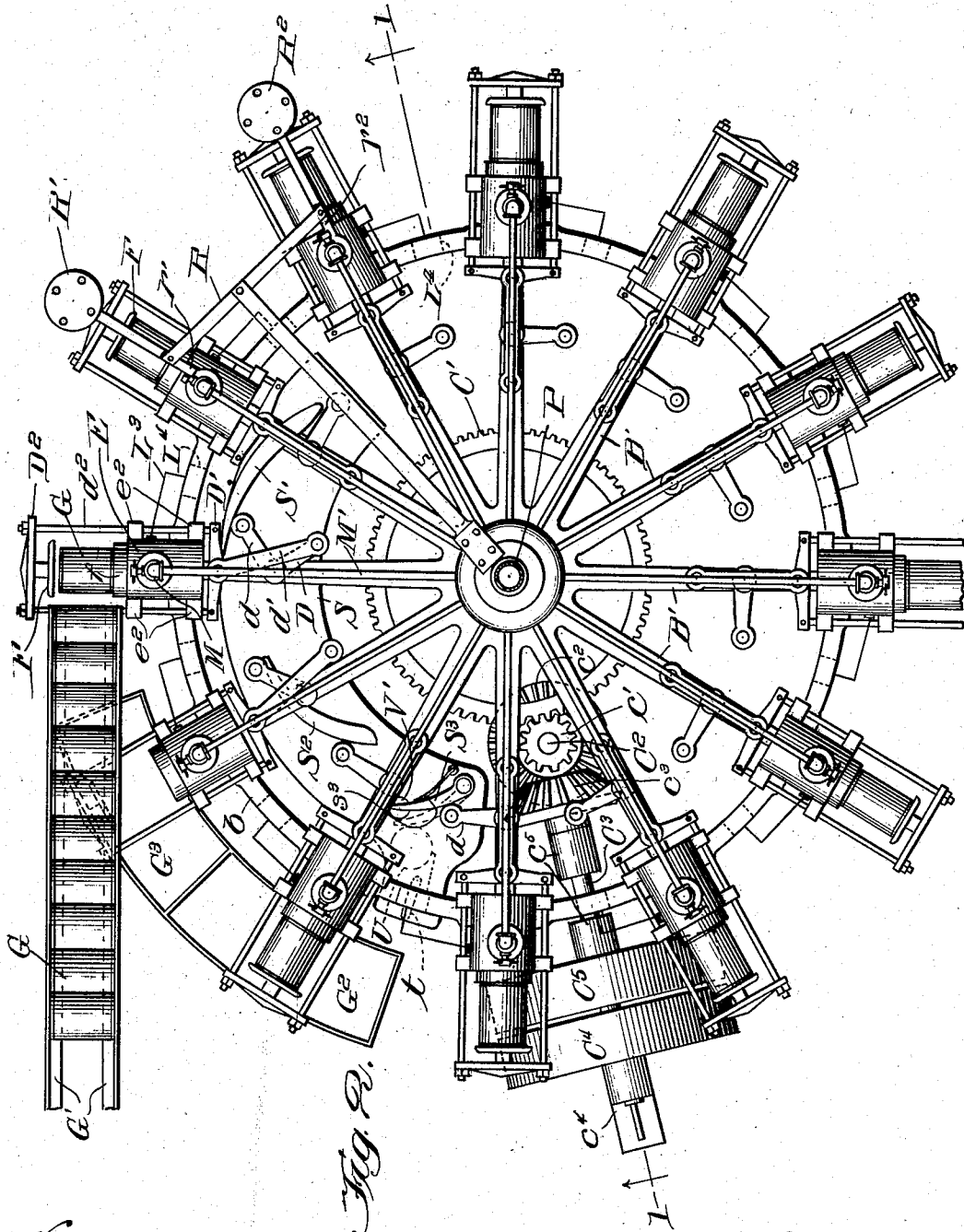
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Witnesses:
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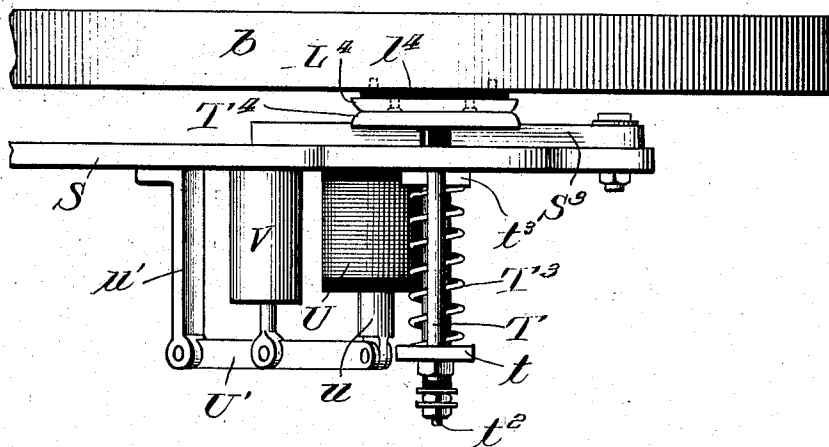
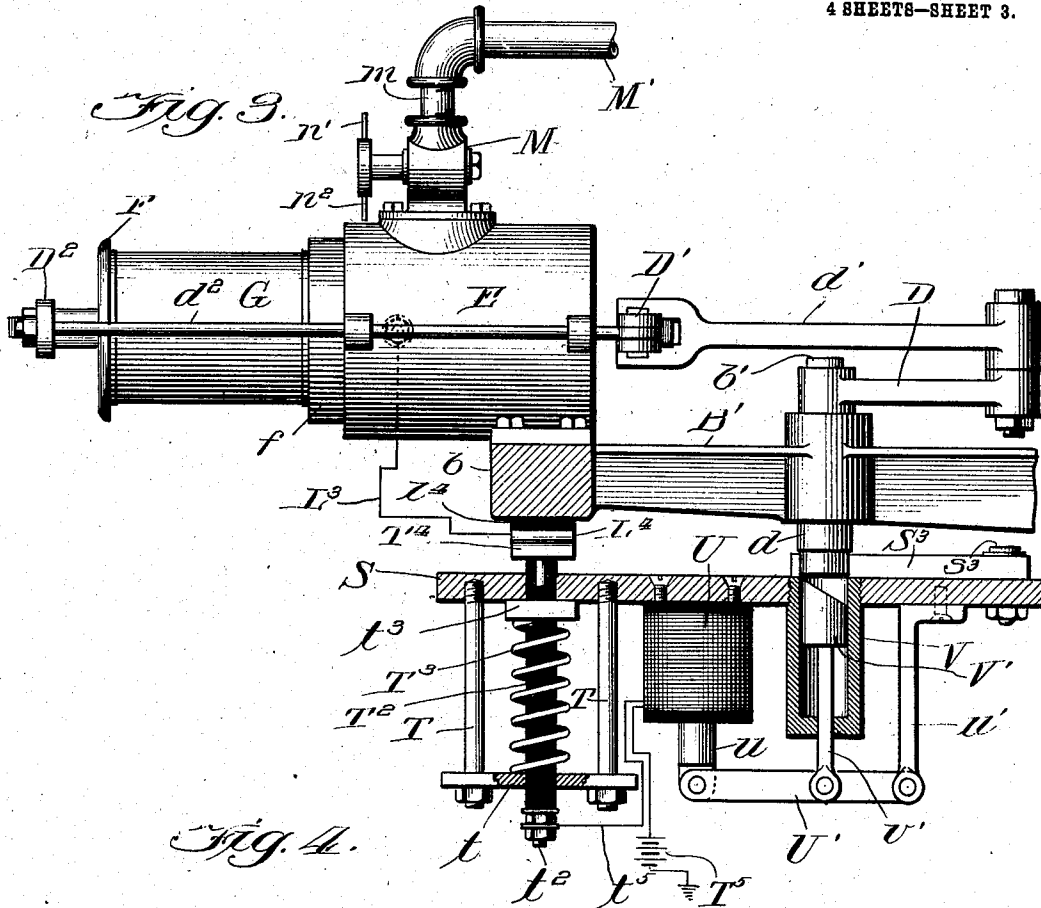
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4 SHEETS—SHEET 3.



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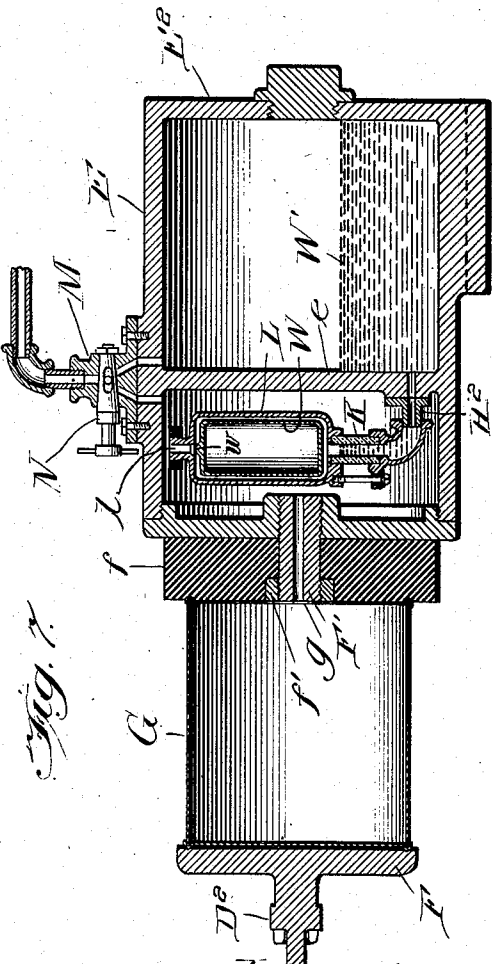
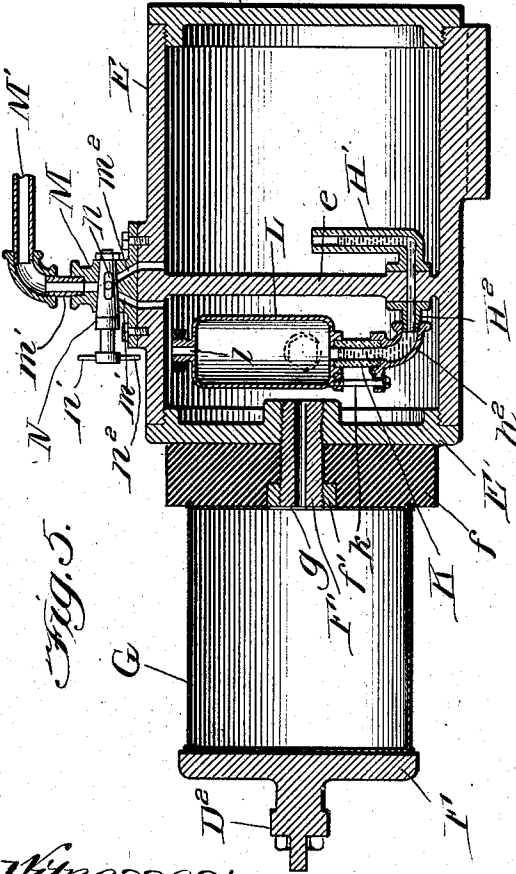
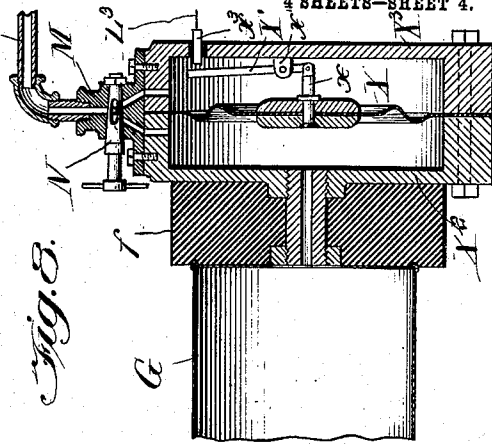
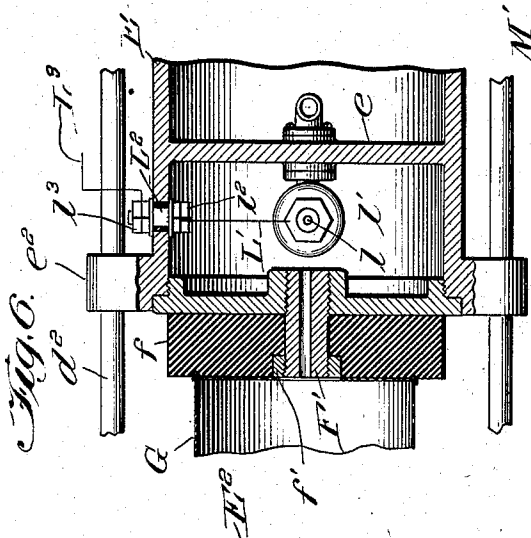
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W. H. NORDHAUS.
CAN TESTING APPARATUS.
APPLICATION FILED MAY 25, 1905.

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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

WILLIAM H. NORDHAUS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO AMERICAN KEY CAN COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY, AND ONE-FOURTH TO ALOIS WEIDENBAUER, OF CHICAGO, ILLINOIS.

CAN-TESTING APPARATUS.

937,540.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed May 25, 1905. Serial No. 262,140.

To all whom it may concern:

Be it known that I, WILLIAM H. NORDHAUS, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Can-Testing Apparatus, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to can testing machines, and more particularly to machines for automatically separating imperfect from perfect cans.

The primary object of my invention is to provide an improved machine for testing cans, in which an electrically actuated mechanism will be automatically controlled to separate leaky cans from tight ones.

A further object of my invention is to provide an improved machine for automatically testing cans without wetting them, thereby obviating the necessity of drying the tested cans.

A still further object of my invention is to provide an improved machine for automatically receiving sheet metal cans and separating the imperfect from the perfect cans, which will be comparatively simple in construction and efficient in operation.

The embodiment of my invention herein disclosed may be generally described as comprising a horizontal rotary carrier, chambers mounted upon the periphery of said carrier, each chamber having two compartments, means for automatically clamping a can against each chamber with the open end of the can communicating with one of the compartments of the chamber, means for automatically admitting equal pressure to the compartments of each chamber at a predetermined point in its movement with the carrier, means actuated by a difference in pressure between the compartments of each chamber for controlling an electric circuit, means actuated by the electric circuit of each chamber for discharging the can if imperfect, at a predetermined point, and me-

chanical means for automatically discharging a perfect can at a different predetermined point in the movement of the chamber with the carrier.

My invention will be more fully described hereinafter with reference to the accompanying drawings in which the same is illustrated as embodied in several convenient and practical forms, and in which—

Figure 1, is a sectional view on line 1—1, Fig. 2, parts being shown in elevation. Fig. 2, a plan view. Fig. 3, an enlarged detail view. Fig. 4, a detail view on the same scale as Fig. 3. Fig. 5, a central sectional view through one of the chambers, showing a can in engagement therewith. Fig. 6, a sectional view of a portion of the chamber and can through a plane at right angle to the plane of Fig. 5. Fig. 7, a view similar to Fig. 5, showing a modification; and Fig. 8, a view similar to Fig. 5, showing still another modification.

Similar reference characters are used to designate similar parts in the several figures of the drawings.

Reference letter A indicates a pedestal provided with a flange *a* around its base, adapted to be secured to a floor or other support.

C' indicates a horizontal gear wheel, supported upon the top of the pedestal A, which meshes with a pinion *c'* fixed to the upper end of a vertical shaft C². The shaft C² is supported at its lower end in a bearing *a'* and adjacent its upper end by a bearing *a''* extending laterally from a bracket A², the latter being interposed between the pedestal and the gear wheel C'. A bevel gear wheel *c''* is fixed upon the shaft C² and meshes with a bevel gear *c''*, fixed upon a horizontal shaft C³, the latter being suitably journaled in supports *c'* and *c''*. Mounted upon the shaft C³ are belt pulleys C⁴ and C⁵, one of which is fixed to and the other loose upon the shaft. It is to be understood, however, that any other suitable means may be provided for imparting the rotary motion to the gear wheel C'.

Mounted above the gear wheel C' and secured thereto, is a carrier comprising a hub B from which radiates arms B', carrying

at their outer ends a ring *b*. Any suitable means may be provided for rigidly connecting the gear wheel *C'* to the hub *B*, such for instance, as a shaft *C* keyed to the gear wheel and hub, as indicated at *c*. The shaft *C* also extends downwardly and is rotatively supported in the pedestal *A*, thereby serving to rotatively mount the gear wheel above the pedestal.

Supported upon the ring *b* of the carrier at the ends of the arms *B'* are chambers *E*, and as such chambers and the mechanism cooperating therewith are identical, the description of one will disclose the construction and operation of all of them.

Referring more particularly to Figs. 5 and 6, it will be seen that the chamber *E* is divided into two separate compartments by a partition *e*. One compartment is closed by the end cap *E*², while the other compartment is closed by an end cap *E'*, having a screw threaded opening extending there-through. A short tube *F'* engages the opening in the cap *E'* and extends through a yielding disk, such as rubber *f*, a ring *f'* being provided on the outer end of the pipe *F'* to retain the cushion against the exterior of the cap *E'*. A hole extends through the partition *e* near the bottom thereof, which communicates with an upwardly projecting tube *H'* within one compartment of the chamber and with an elbow coupling *h*² within the other compartment. The upper end of the elbow *h*² communicates through an interposed glass tube *K* with the interior chamber *L*, the latter having an opening *l* through the top thereof. Any suitable means may be provided for securing the chamber *L* above the elbow, such for instance as rods *k* which also serve to retain the tube *K* clamped between the elbow and chamber *L*. The rods *k* are insulated from the elbow. Within the tube *H'*, elbow *h*², and glass tube *K*, is mercury or some equivalent fluid which is a good conductor of electricity. A conductor *L'* extends from clamp nuts *l'* at the upper end of the chamber *L* to clamp nuts *l*², on a binding post *L*² extending through the wall of the chamber. A lead *L*³ extends from clamp nuts *l*³, on the outer end of the binding post *L*² and is connected to a contact *L*⁴ carried by but insulated from the ring *b* immediately beneath the chamber.

A can *G* is retained against the cushion *f* of each chamber with the hole *g* in communication with the pipe *F'*. Any suitable means may be provided for clamping the can against the cushion, such for instance as a disk *F* supported by a cross-head *D*² from which rods *d*² extend through guide eyes *e*², *e*³, at each side of the chamber *E* to a cross-head *D'* located adjacent the inner end of the chamber. The cross-head *D'* is pivotally connected to a link

d', the opposite end of which is pivotally connected to an arm *D* rigidly secured to the upper end of a stub shaft *b'*, the latter being journaled in the arm *B'*. The lower end of the stub shaft has rigidly secured thereto a crank arm *d*, such crank arm together with the stub shaft and arm *D* constituting a bell-crank lever.

Beneath the arms *B'* of the carrier is a table *S*, which may be conveniently supported by brackets *s* extending from the pedestal *A*. Secured to the upper surface of the table *S* is a cam *S'* projecting into the plane of the arm *d* and adapted to be engaged thereby to clamp the cam against the cushion of the chamber. A second cam *S*² is supported upon the table *S* also in the plane of the crank *d* to oscillate the latter and release the cam from engagement with the chamber. *S*³ indicates a movable cam also supported by the table *S* at a point in advance of the cam *S*² when the carrier rotates in the direction of the hands of a watch. A spring *s*³ normally swings the cam *S*³ into the path of movement of the crank arm *d* but permits the cam to yield without oscillating the lever *d*, unless locked in the path of the arm by the following mechanism: A solenoid *U* is supported beneath the table *S* adjacent the outer end of the cam *S*³ and is provided with a plunger *u* pivotally connected to a lever *U'*, the opposite end of the latter being fulcrumed upon a bracket *u'* depending from the table. Located intermediate of the solenoid and bracket *u'* is a hollow guide *V* within which is movably supported a stop *V'* carried by a rod *v'* pivotally connected to the lever *U'* intermediate of its ends. The upper end of the guide *V* is located immediately back of the outer end of the cam *S*³ as indicated in Fig. 2.

Supported beneath the table *S* adjacent the solenoid *U* is a frame comprising rods *T*, *T*, united at their lower ends by a yoke *t*. Guided by the yoke *t* is a vertical sleeve *T*², made of insulating material within which extends a rod *t*². The upper end of the rod *t*² projects above the table *S* and carries a shoe *T*⁴ which is adapted to be engaged by a contact *L*⁴, carried by but insulated as shown in *l*⁴, from the ring *b* beneath each chamber *E*. A spring *T*³ surrounds the sleeve *T*² and normally projects the same upwardly through engagement at its lower end with the yoke *t* and at its upper end with a collar *t*³ fixed upon the sleeve. A lead *t*⁵ extends from clamp nuts on the lower end of the rod *t*² to the winding of the solenoid. The winding of the solenoid is connected by a lead with a grounded battery *T*⁵, or other source of electricity.

Secured concentrically above the hub *B* of the carrier is a post (*o*) at the upper end

of which is formed a chamber O' with which communicates a conduit P for supplying compressed air. Any suitable means may be provided for securing the post O to the hub B, such for instance as screws passing through a flange *o* around the bottom of the post. The lower end of the conduit P may be conveniently supported in a bracket P', carried by an arm *p* which is supported upon a bar R, the ends of the latter being mounted upon brackets *r*' and *r*². Standards R' and R² support the outer ends of the bracket *r*' and *r*² as clearly shown in Figs. 1 and 2. As the conduit P is stationary while the chamber O rotates with the carrier, a swivel connection is provided between the conduit and chamber with which the hole *o*' in the chamber communicates. A pipe M' extends radially from and communicates with the chamber O', such a pipe being located above each arm B' of the carrier, and communicating at its outer end through a coupling *m*' with a valve casing M, the latter being mounted upon the corresponding chamber E and communicating through ports *m*' and *m*² with both compartments therein. Located within the valve casing M is a two-way valve N having a passage *n* which is adapted to place the coupling *m*' in communication with the compartments at either side of the partition *e* in the chamber. Projecting upwardly from the stem of the valve N is a pin *n*', while a similar pin *n*² extends downwardly from the valve stem. The bracket *r*' is provided with a depending end located in the path of movement of the pin *n*', while a similar depending end on *r*² extends into the path of movement of the pin *n*².

The operation of my invention is as follows: The sheet metal cans which are to be tested, are placed in a chute G', the lower end of which terminates above the space between the cushion *f* and disk F of each chamber as the carrier is rotated. A belt leading from a source of power communicates motion to the shaft C³ through engagement with the fixed pulley thereon. The rotation of the shaft C³ is imparted to the vertical shaft C² through the meshed beveled gears *c*³ and *c*². The carrier B is rotated by the shaft C² through the medium of the pinion *c*' and gear wheel C'. The carrier is rotated toward the right in Figs. 1 and 2, and as each chamber E passes beneath the end of the chute G', a can G is received in position to be clamped against the cushion *f*, when the arm *d* engages the cam S', thereby oscillating the arm D and through the link *d*' drawing the disk F tightly against the outer end of the can. The inclination of the cam S³ is such that as each arm *d* passes from engagement therewith, the link *d*' aligns with the arm D, thereby locking the can securely against the

cushion and placing the interior thereof in communication through the tube F', with the adjacent compartment of the chamber E. As each chamber is carried beneath the arm *r*', the pin *n*' is engaged and oscillated a distance sufficient to turn the valve M into position to connect the pipe M' with both of the compartments of the chamber. Compressed air then flows into both compartments, creating an equal pressure therein. A further movement of the chamber with the carrier causes the pin *n*² to engage the end of the bracket *r*² and to be oscillated thereby a distance sufficient to turn the valve N into the position shown in Fig. 5, in which communication with the compartments of the chamber is cut off.

If the can contains a leak, either through a defect in the tin plate or in the soldered joints, the pressure from the compartment communicating therewith escapes, thereby lowering the pressure in such compartment below that in the other compartment of the chamber. A difference of pressure in the compartments results in the column of mercury being forced upwardly within the chamber L, thereby, when the chamber reaches a point above the shoe T⁴ closing the following circuit, the tube H' which is connected to ground through the machine, the mercury, chamber L, lead L', binding post L², lead L³, contact L⁴, shoe T⁴, rod *t*², lead *t*⁵, winding of the solenoid U, battery T⁵ to ground. The solenoid U is consequently energized and the plunger *u* drawn upwardly within the same, thereby forcing the stop V' upwardly back of the outer end of the cam S³, so that the latter cannot be swung when engaged by the arm *d*. The bell crank lever is consequently oscillated, thereby removing the disk F away from the outer end of the can, and permitting the latter to fall into the chute G² or other receptacle.

If the can is perfect, then the pressure between the two compartments of the chamber remains constant and the circuit is not closed, owing to the mercury terminating within the glass tube K below the chamber L which is insulated from the elbow *h*² owing to the insulation around the rods *h*. When the crank arm *d* engages the cam S³, it is, therefore, swung from the position shown in dotted lines in Fig. 2 to that shown in full lines, permitting the bell crank lever to pass without releasing the can. When, however, the crank arm *d* engages the fixed cam S³, the can is released and falls within a hopper G³, or other receptacle.

In Fig. 7, I have illustrated a modified means of closing the circuit for energizing the solenoid U when the can is defective. Within the chamber L is a float W, having a valve *w* at the upper end thereof adapted

to seat against and close the opening *l* leading from the interior of the chamber *L*. The pipe *H'* is omitted and in lieu of mercury acidulated water *W'* or other fluid which is a conductor of electricity is employed. The greater pressure in the compartment above the fluid when a leaky can reduces the pressure in the adjacent compartment, forces the fluid upwardly within the chamber *L*, thereby closing the circuit and also when sufficient fluid is forced within the chamber *L* closing the outlet *l* by elevating the float *W* to such a position that the valve *w* thereon seats against the inner end of the outlet. The float serves to prevent the escape of the fluid from the chamber *L* when there is a great difference in the pressure of the two compartments. By using acidulated water or other fluid of less specific gravity than mercury, a more sensitive circuit closer results.

In Fig. 8, I have illustrated still another modification in which the chamber is formed in two portions X^2 and X^3 , between which is clamped a diaphragm *X*. A post *x* is carried by the diaphragm *X* and is pivoted to a lever X' , the latter being fulcrumed at x' . Located in the path of movement of the end of the lever X' is a contact x^3 insulated from the chamber and connected to the lead L^2 . In this modification of my invention a reduction of pressure at one side of the diaphragm *X* due to a leaky can results in the diaphragm being deflected, thereby oscillating the lever X' so that it engages the contact x^3 and closes the circuit.

From the foregoing description it will be observed that I have invented an improved machine for automatically testing cans and separating the imperfect cans from the perfect ones, in which a defective can results in a circuit being closed through an electrically actuated device which effects the discharge of an imperfect can from the machine at a predetermined point, while a perfect can is permitted to be carried to another predetermined point.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a can testing machine, the combination of means for supporting a can, of mechanism for actuating said supporting means to release the can, an actuator for said mechanism, and an electromagnetic governing system for said actuator under the control of a can on said supporting means and constructed and arranged to alter its condition according as the can is perfect or defective.

2. In a can testing machine, the combination with means for supporting a can, of an electric circuit, a controller for said circuit governed by said can and arranged to alter the condition of the circuit according as the

can is perfect or defective, and electrically actuated means in said circuit for controlling the means for supporting the can.

3. In a can testing machine, the combination with a carrier, of means for detachably supporting a can upon said carrier, means for detaching perfect cans from said carrier at a predetermined point in its travel, and electrically controlled means for detaching a defective can from said carrier at a different predetermined point in its travel.

4. In a can testing machine, the combination with a rotary carrier, of means for detachably supporting a can upon said carrier, mechanical means for detaching a perfect can from said carrier at a predetermined point in its travel, electrically controlled means for detaching a defective can from said carrier at a different predetermined point in its travel, and a circuit controller automatically actuated by a defective can for governing the operation of said electrically controlled means.

5. In a can testing machine, the combination with a carrier, of a chamber mounted on said carrier, means for detachably supporting a can upon said carrier with its interior in communication with said chamber, means for producing a predetermined pressure within said chamber, and electrically actuated means controlled by a change in the pressure in said chamber for detaching a defective can from said carrier.

6. In a can testing machine, the combination with a carrier, of a chamber mounted upon said carrier, means for detachably supporting a can upon said carrier with its interior in communication with said chamber, means for producing a predetermined pressure within said chamber, electrically actuated means controlled by a change in the pressure in said chamber for detaching a defective can from said carrier at a predetermined point in its travel, and mechanical means for automatically detaching a perfect can from said carrier at a farther predetermined point in its travel.

7. In a can testing machine, the combination with a carrier, of a chamber having two compartments therein mounted upon said carrier, means for detachably supporting a can upon said carrier with its interior in communication with one compartment of said chamber, means for producing an equal predetermined pressure in both compartments of said chamber, and electrically actuated means controlled by a difference in pressure in said compartment for detaching a defective can from said carrier.

8. In a can testing machine, the combination with a carrier, of a chamber mounted upon said carrier and having two compartments therein, means for detachably supporting a can upon said carrier with its interior in communication with one com-

partment of said chamber, means for producing an equal pressure within both compartments of said chamber, electrically actuated means for detaching a defective can from said carrier, a circuit for said electrically actuated means, and a controller for said circuit operated by a difference in pressure in said compartments.

9. In a can testing machine, the combination with a carrier, of means for detachably supporting a can on said carrier, means located at a predetermined point in the travel of said carrier for detaching a can therefrom, an electrically actuated device for governing the operation of said means, a circuit for said device, means for testing the leakiness of the can and a controller automatically closing said circuit when the can is leaky.

10. In a can testing machine, the combination with a rotary carrier, of means for detachably supporting a can on said carrier, automatic electrically controlled means for releasing a leaky can from the carrier at a predetermined point in its travel, and automatic mechanical means located at a farther point in the travel of the carrier for releasing a perfect can.

11. In a rotary carrier, the combination with a chamber mounted thereon, of means for detachably supporting a can upon said carrier with its interior in communication with said chamber, means for creating a predetermined pressure in said chamber, a yielding cam located at a predetermined point in the travel of said carrier for detaching a can therefrom, a stop for preventing the yielding of said cam, a solenoid for actuating said stop, a circuit for said solenoid, and a controller for said circuit actuated by a change in the pressure in said chamber.

12. In a rotary carrier, the combination with a chamber having two compartments mounted upon said carrier, of means for detachably supporting a can upon said carrier with its interior in communication with one compartment of said chamber, means for creating the same pressure in the compartments of said chamber, a yielding cam at a predetermined point in the travel of said carrier for detaching a can therefrom, a stop for preventing the yielding of said cam, a magnet for actuating said stop, a circuit for said magnet, and a controller for said circuit actuated by a difference in the pressure in said compartments.

13. In a rotary carrier, the combination with a plurality of chambers mounted thereon, means for successively detachably supporting cans upon said carrier, with the interior of each can in communication with a chamber, means for successively creating a pressure in said chambers, a yielding cam located at a predetermined point in the travel of said carrier for successively detaching the cans therefrom, a stop for preventing the yielding of said cam, a magnet for actuating said stop, a circuit for said magnet, and a controller for said circuit carried by each chamber and actuated by a variance of pressure in said chamber.

In testimony whereof, I sign this specification in the presence of two witnesses.

WILLIAM H. NORDHAUS.

Witnesses:

GEO. L. WILKINSON,
H. B. LEHMAN.