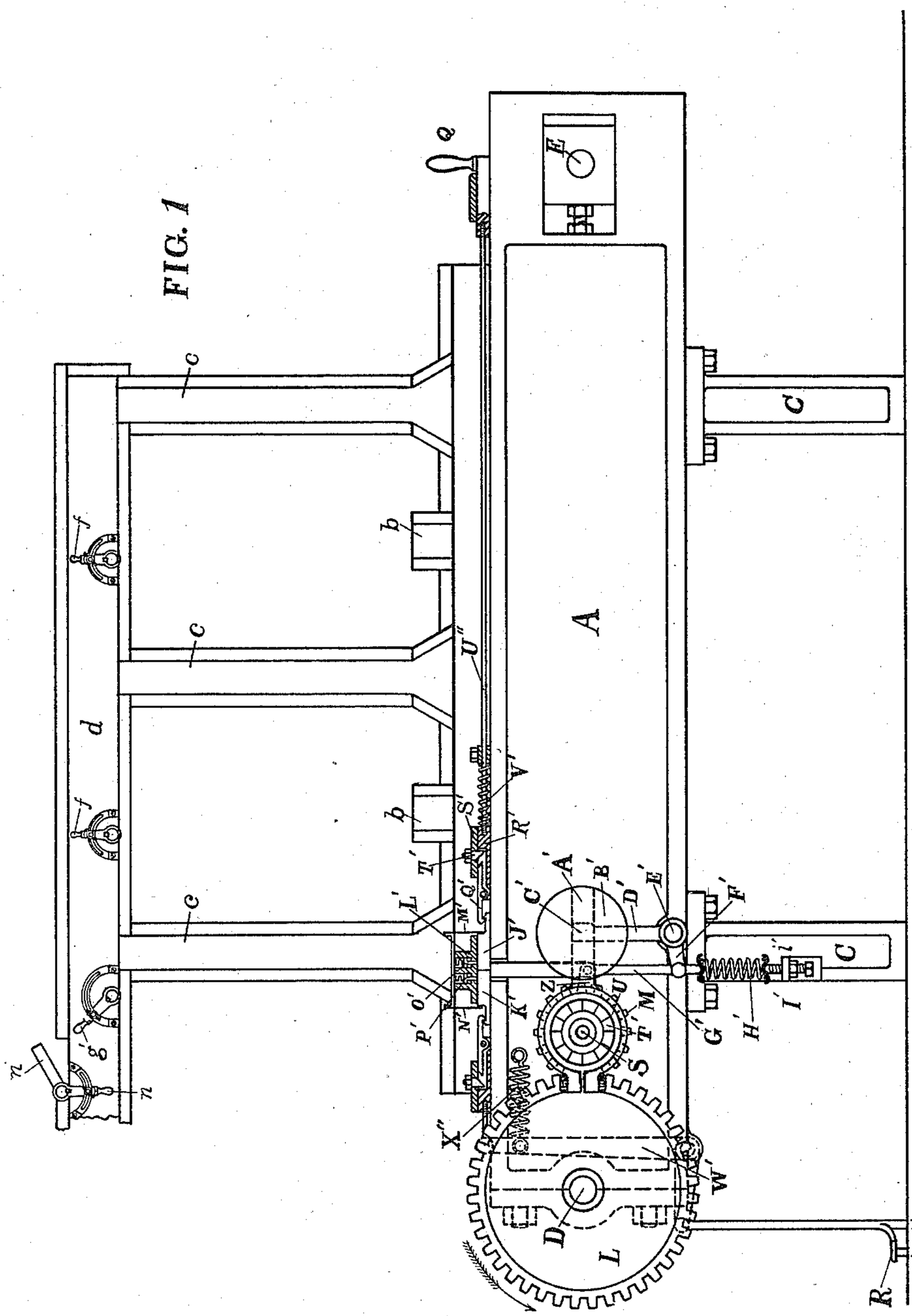
(No Model.) 4 Sheets—Sheet 1.

F. A. HUBEL & J. M. SMITH.

KILN FOR DRYING GELATIN CAPSULES.

No. 579,392. Patented Mar. 23, 1897.

FIG. 1



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(No Model.) 4 Sheets—Sheet 2.

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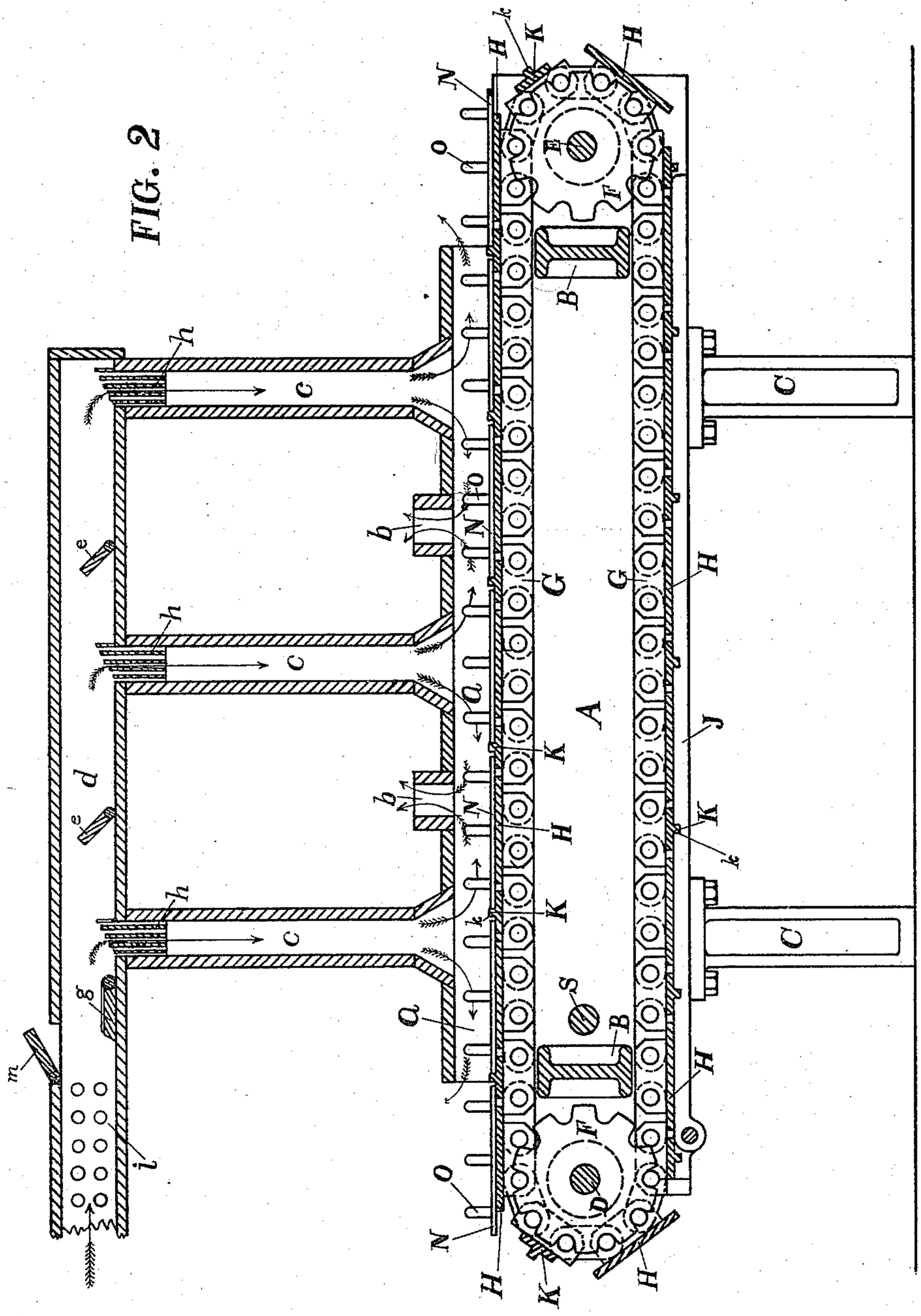
FIG. 2



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KILN FOR DRYING GELATIN CAPSULES.

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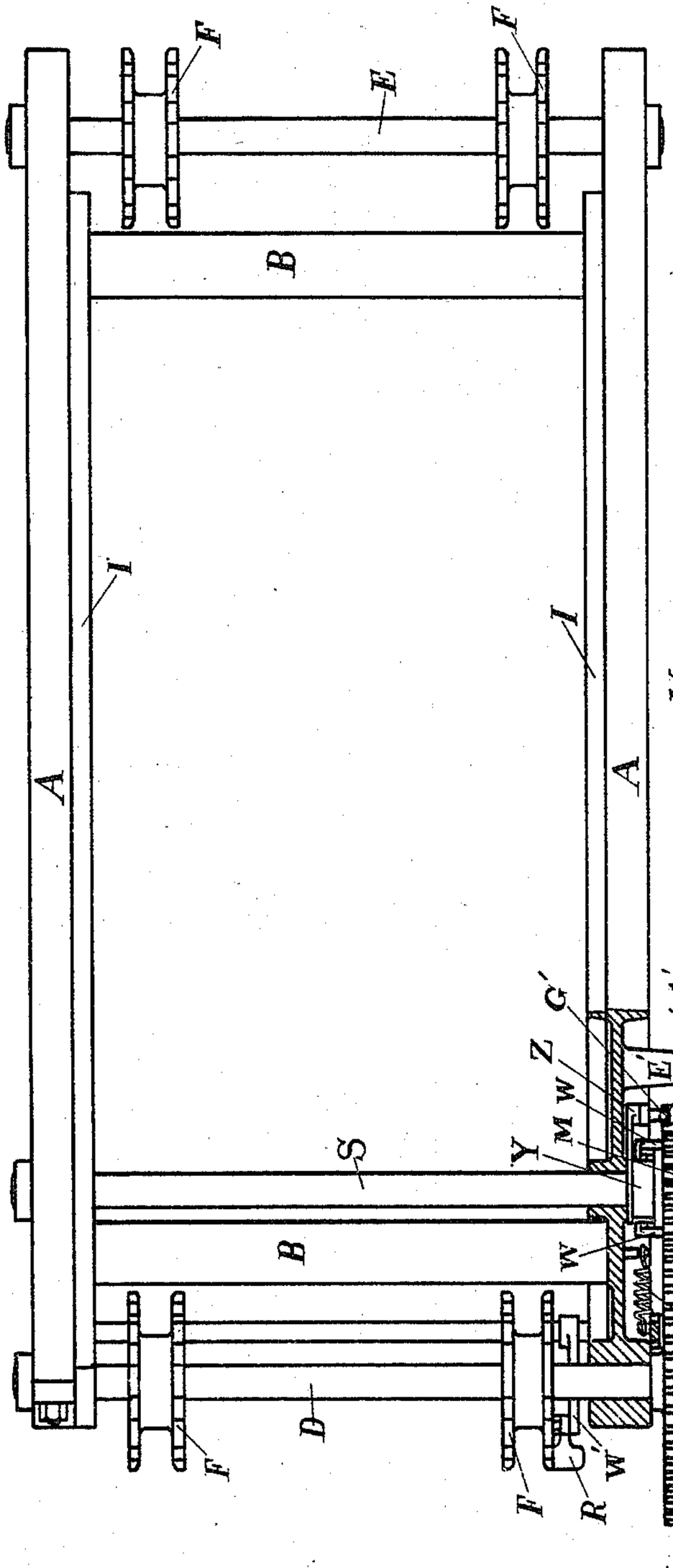

FIG. 3

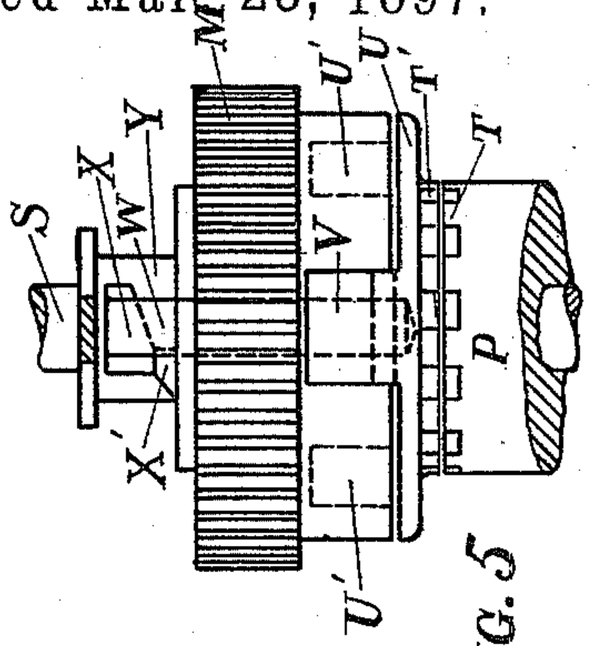

FIG. 5

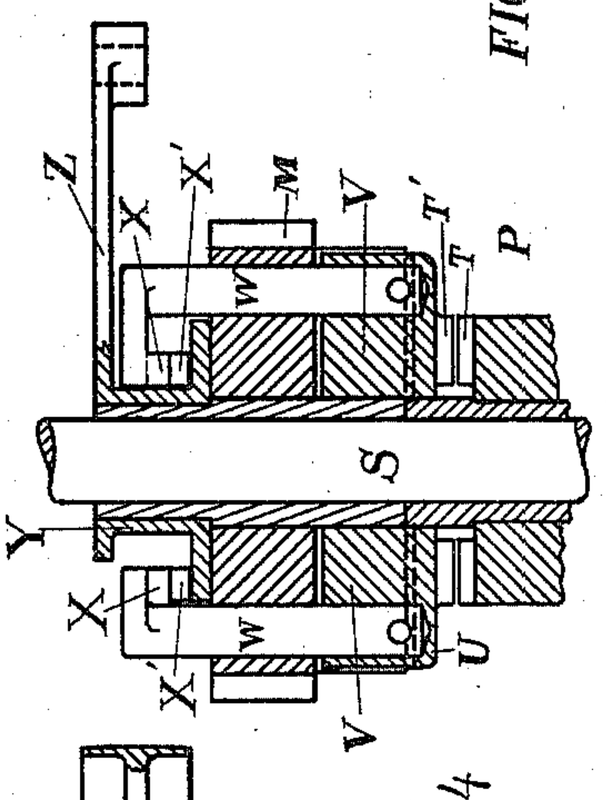

FIG. 4

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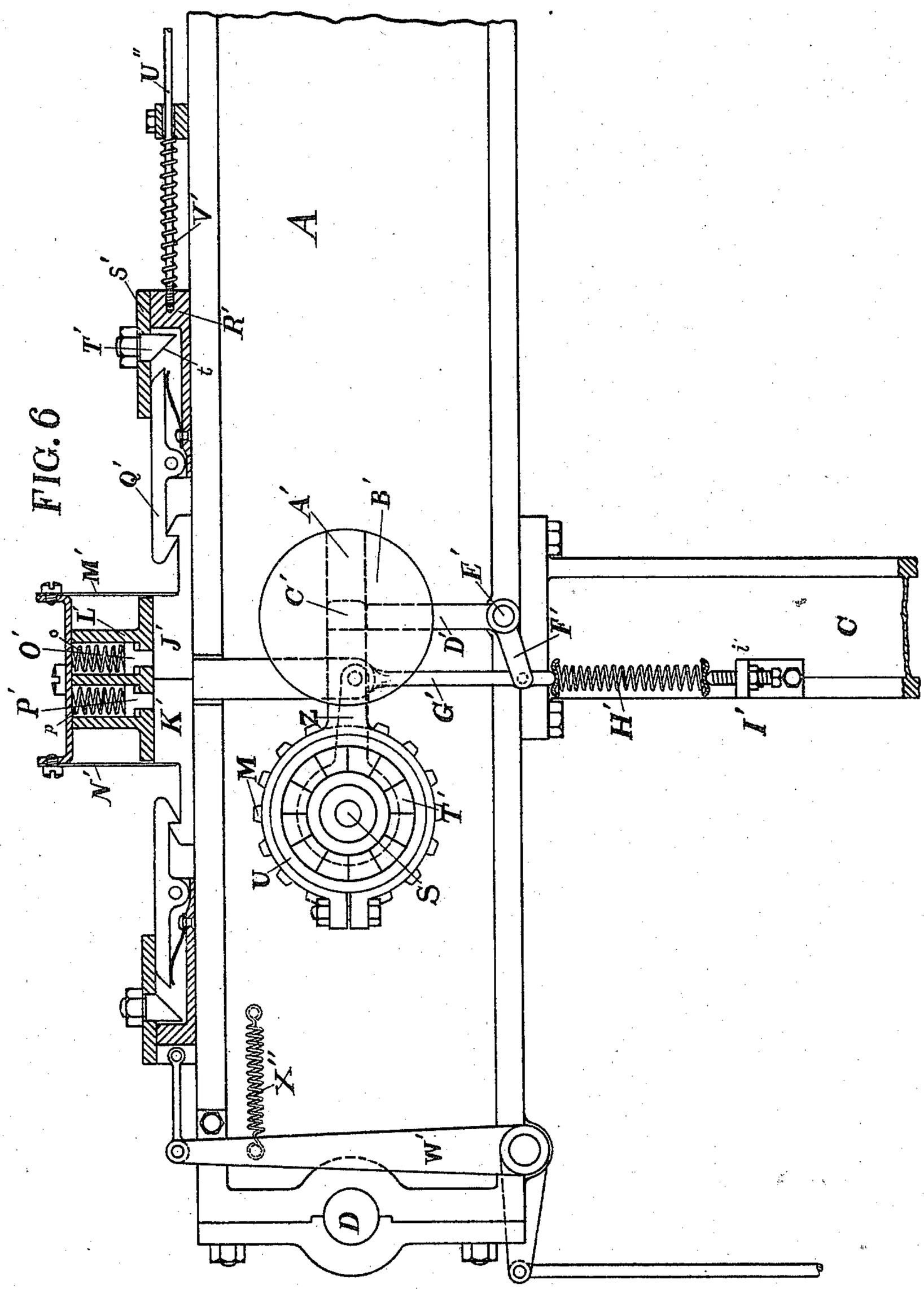
FIG. 6



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UNITED STATES PATENT OFFICE.

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SAID SMITH ASSIGNOR TO SAID HUBEL.

KILN FOR DRYING GELATIN CAPSULES.

SPECIFICATION forming part of Letters Patent No. 579,392, dated March 23, 1897.

Application filed January 20, 1894. Renewed June 19, 1895. Serial No. 553,368. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK A. HUBEL and JESSE M. SMITH, citizens of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Kilns for Drying Gelatin Capsules; and we declare the following to be a full, clear, and exact description of the invention, 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.

This invention relates to capsule-drying kilns, and has for its object an improvement in that class of machines in which the article to be kiln-dried is fed into the kiln at one end, passes slowly through the kiln, and emerges dry from the other end, and the result is effected by exposing the article while in its passage through the kiln in a systematic manner to currents of air of controllable quantity, temperature, and direction, so as to dry the article evenly and regularly.

When applied to the drying of gelatin capsules, the capsules are preferably held on mold-pins of the desired shape and size. One or more of said mold-pins are fixed to a plate, and these plates are fed into one end of the dry-kiln and taken out at the other.

In the drawings, Figure 1, Sheet 1, shows a side view of the machine with driving-wheel removed. Fig. 2, Sheet 2, shows a vertical longitudinal section. Fig. 3, Sheet 3, shows a top view, partly in section, and having the wind-trunks and traveling apron removed. Fig. 4, Sheet 3, shows an enlarged section of the clutch which transmits motion to the machine. Fig. 5, Sheet 3, shows a plan view of the clutch. Fig. 6, Sheet 4, shows an enlarged section of the starting mechanism.

The frame, as illustrated in the drawings, is formed of two side pieces A A, connected by cross-beams B B and supported on legs C C.

A shaft D is journaled in one end of the frame, and another shaft E at the other end is preferably journaled in adjustable bearings.

Each shaft is provided with sprocket-wheels F F, and one or more sprocket-chains G G pass around the sprocket-wheels and connect the shafts together.

There are plates H running across the machine parallel to the shafts D E, which are connected to the sprocket-chains and which rest upon ways I and J, formed on the inner sides of the side pieces A A. Plates K, each having a projecting rib *k*, are placed intermediate between plates H and are connected to the sprocket-chains and travel on the same ways. Plates H and K form a traveling apron.

The shaft D receives an intermittent motion through the gear-wheel L and pinion M. The pinion makes one revolution and then rests. The two gears are so proportioned that the sprocket-chain advances a distance equal to the distance from center to center of the plates K K and stops when the first and last plates H H on the top side of the apron are horizontal.

The mold-plates N, carrying the mold-pins O, are thus readily placed on the plate H at the receiving end of the kiln and pushed back against the rib on plate K, while the mold-plates are readily taken off at the other end.

It will be seen that when the mold-plates are in transit through the kiln they are held in place between the ribs of plates K.

The mold-plates will generally be put into the kiln by one person and taken out by another, and the traveling apron must not advance until the desired number of mold-plates have been put onto the receiving-plate H and all the mold-plates taken off from the delivery-plate H. It is therefore highly desirable in order to prevent accidents that means be provided whereby the operator at each end of the machine may set the parts of the machine ready to start, but that neither can start it until the other is ready and has so set the parts. The means shown in the drawings for starting the machine we have found effective, but other means may be used without departing from our invention.

The starting mechanism shown in the drawings consists of a clutch intermediate between the driving-pulley P and the pinion M, whose disengaging mechanism is connected to a

starting-handle Q at the receiving end of the machine and to a starting-pedal R at the delivery end.

The pulley P is mounted loose on the shaft S, which is fixed to the frame.

The pulley-hub is provided with clutch-teeth T, which engage teeth T′, formed on a collar U, which is connected with the pinion M. The hub of the pinion is slotted to receive the lugs V V, formed on the collar U, so that the collar may slide lengthwise of the shaft, but cannot turn except with the pinion. The collar U has connected to it one or more rods W, which pass loosely through holes in the pinion M.

The rod W has formed on its end an inclined lug X, which engages a similar lug X′. Lug X′ is fixed to a sleeve Y, which is loose on the extended hub of pinion M, and this sleeve has fixed to it an arm Z.

When the clutch is engaged, the pinion revolves with the pulley, while the sleeve stands still.

As the pinion revolves the inclined lug X rides up on the lug X′ and draws the collar U back out of engagement with the pulley, and the pinion stops after one complete revolution.

When the machine is to be started, the sleeve Y is turned by the arm Z until the lug X′ travels past lug X, which permits springs in the cavities U′ to force the collar U into engagement with the pulley.

To insure that the pinion M makes a complete revolution, an arm A′ is secured to the pinion, carrying a weight B′, which by its inertia completes the motion after the clutch-teeth are drawn apart. The pinion is stopped positively in the same position each time by a lug C′, fixed to the arm A′, engaging with the end of a bent arm D′ F′, which is pivoted to the frame at E′.

As shown in Fig. 6, the mechanism has come to rest, with the lug C′ of the arm A′ resting on the upper end of the branch D′ of the bent lever or arm D′ F′. The sliding stops J′ K′ are in engagement with the end of the link G′ and prevent it from rising, but it is held against the upward pressure of the spring H′. As soon as both the slides J′ K′ are retracted, as hereinafter explained, the link G′ rises. This swings the upper end of the arm D′ from under the lug C′, engages the clutching mechanism before described, and pinion M begins to turn. The lug C′ next engages the end of the arm F′ and pushes it downward until the upper end of the link G′ drops below the lower sides of the sliding stops J′ K′, and these stops slide in over the top of the link and hold it from rising again. The same movement restores the upper end of the bent arm D′ F′ to position to engage the lug C′, when the revolution of the pinion is completed.

The branch F′ of the arm D′ F′ is connected to the end of the arm Z by a link G′. The end of the link G′ extends in one direction beyond the pin which connects it with the branch F′ and abuts against the washer of a spring H′. This spring H′ is held to the frame, and its tension is adjustable by means of a screw I′, running through the lug *i*′ on the frame and bearing against a washer at the end of the spring H′. The spring H′ is compressed for adjustment between the end of the link G′ and the end of the screw I′ and tends constantly to give to the link G′ a thrust against the stops J′ and K′, or against O′ and P′, when the stops J′ and K′ are retracted, as will be explained. This upward thrust of the link G′ becomes an upward movement when the stops J′ and K′ are retracted, and in its upward movement the link G′ swings the outer end of the arm Z, turns the sleeve Y, and brings into action the clutch between the pinion M and the loose pulley P.

J′ K′ indicate two sliding stops so arranged that both of them engage with and act as stops to the movement of the link G′, and so arranged that both must be retracted before the link G′ can move under the actuating force of the spring H′. As shown in the drawings, the two stops J′ and K′ meet at or meet in front of the link G′ and at about the middle line of the link G′. Both are arranged to slide under the block L′, which forms a part of the main frame or is secured to the main frame, one of them, J′, being connected with mechanism to retract it, which is operated from the feeding end of the machine, and the other, K′, being connected with the mechanism adapted to retract it, which is operated from the delivery end of the machine. Above the stops J′ K′ are two small sliding stops O′ P′. The office of the stop O′ is to engage with the inner end of the stop J′ when the stop J′ has been retracted and to prevent the stop J′ from again moving inward over the end of the link G′. The office of the stop P′ is to coact with the stop K′ in the same way. Both of the stops O′ and P′ are forced downward by the springs *o* and *p*. The slides J′ and K′ are in engagement with springs M′ and N′, the strain of which tends to force their inner ends toward each other.

The stop J′ has a hook on its outer end which engages with the hooked end of the lever Q′, which is pivoted near its middle to a sliding block R′. This block R′ slides in a guide S′, that is fixed to the frame. An adjustable lug T′, provided with an oblique engaging face *t*, projects through the wall of the guide S′ in position to engage with the end of the hooked lever Q′ when the sliding block R′ and the hooked lever which it carries is retracted. The sliding block R′ is connected by a rod U″ with the starting-handle Q. (See Fig. 1.) This starting-handle Q may slide in guides on top of the frame or may turn on an axle.

It will be observed that the axes of the two stops O′ and P′ are parallel with the axis of the link G′ and the axes of the stops J′ and K′ are across or perpendicular to the axis of the link G′. The inner or adjacent sides of

the stops O′ and P′ are so closely adjacent to each other that both of the stops O′ and P′ will engage or can engage with the end of the link G′ at the same time, and their outer sides are so far removed from each other that the engaging face of each will overhang the sides of the link G′ somewhat.

The force of the spring H′ is greater than the combined forces of the springs O and P. It results from this arrangement that when either of the sliding stops J′ or K′ has been retracted the stop O′ or P′ drops downward in front of the inner end of the stop J′ or K′, as the case may be, and prevents its return or inward movement under the force of the spring M′ or N′. When both of the stops J′ and K′ have been retracted, the end of the link G′ rises into contact with both of the stops O′ and P′, lifts them upward until they cease to oppose the inward motion of the stops J′ and K′, and the stops J′ and K′, under the force of the springs M′ and N′, move inward under the faces of the stops O′ and P′ until the inner ends of the stops J′ and K′ contact the sides of the link G′, and the stops J′ and K′ are now in position to move still farther inward over the end of the link G′ when that link has been forced downward by the movement of the arm A′ in a way which will be described.

A spring V′, abutting against the block R′ and a lug on the frame, tends to force the block and its hook Q′ inward as soon as the handle Q is released.

A similar arrangement is connected to plunger K′, except that the handle Q is replaced by the pedal R, bell-crank W′, and spring X′.

It is immaterial what form of handle and connection to block R′ is used, and the one shown may be replaced by the pedal shown at the other end or any other convenient form.

The top of the frame is covered over, so as to form a chamber *a*, (see Fig. 2,) through which the articles to be dried move. This chamber is open at each end and may have one or more openings *b* through its top. One or more wind-trunks *c* pass through the top of chamber *a* and connect with another wind-trunk *d*, which is connected with a fan or other source of air-supply. The duct *d* is provided with doors *e* and *g*, which may be made adjustable, if desired, by handles *f* and *g′*, Fig. 1, or other suitable means. The trunk *d* is also provided with a door *m*, controlled by a handle *n*, which permits a part or all of the air to escape and not pass through the kiln.

A series of plates *h* may be placed in the trunk *c* for the purpose of straightening and equalizing the air-current in the trunk. The plates may be made adjustable, if desired.

One or more heating-coils *i* are placed in the air-current, and may be located in the air-trunk *d* or in the air-current entering the fan, or, if desired, in the air-trunks *c c*. Arrows in the air-trunks indicate the direction of flow of air.

The operation of the machine is as follows: Supposing the kiln full of mold-plates, as shown in Fig. 2, except the first row of plates on the right-hand or receiving end, the operator at the receiving end begins putting in mold-plates, while the operator at the delivery end begins taking off. When the receiving-plate H is full, the operator pulls handle Q, which draws back plunger J′, and the small plunger O′ moves down behind it and holds it back. As handle Q is drawn back the hook Q′ engages the lug T′, which unhooks plunger J′, so that it cannot be held out by holding onto the handle Q. When the operator at the delivery end has taken off the last plate, the pedal R is depressed, which draws back the plunger K′. If the plunger J′ had been previously drawn back, the link G′, being now unresisted at its upper end, is forced up by spring H′ until it strikes the projecting ends of the two small plungers O′ P′. This disengages plungers J′ K′ and lets them in against the sides of link G′. The link G′ in moving upward swings the arm D′ on its pivot and throws its end out free of the lug C′, and at the same time raises the arm Z, which permits the clutch-teeth T T′ to engage each other and start the machine. The lug C′ as it moves downward engages the end of arm F′, forcing it down against the spring-pressure of spring H′ until the upper end of link G′ sinks below the plungers J′ K′, when they fly in and hold the rod and arm D′ in the position shown in Fig. 1. The motion of the machine continues till the inclined lugs X X′ disengage the clutch, when the motion is continued by the inertia weight B′ till arrested by the positive stop D′. The air from the fan passes through wind-trunk *d* and into trunks *c c*, and then passes down into the chamber *a*, where it is deflected and flows in both directions and out through the ends of the chamber and the openings *b b* into the room. The capsules or other articles as they pass through the chamber *a* are thus exposed to currents of air which strike them in different directions, insuring even drying.

The temperature of the air-currents may be regulated by regulating the amount of heat in the coils *i i*.

The quantity of air flowing to different parts of the kiln may be regulated by the doors *e e*, controlled by handles *f f*, and door *g*, controlled by handle *g′*, and by door *m*, controlled by handle *n*, which latter permits part or all of the air to escape without passing through the kiln.

It is evident that one air-inlet and two air-outlets, the outlets being the ends of the air-chamber, would produce the result sought by this invention, and it is evident that the air-inlets could become the air-outlets and the air-outlets the air-inlets by changing the direction of the supply of air, and it is evident that the means for forcing the air through the air-chamber could be at the point or points where the air comes in or where it goes out, and it is further evident that such changes

can be made without departing from the spirit of this invention.

What we claim is—

1. In a kiln for drying gelatin capsules, the combination of a traveling table composed of transverse plates mounted on endless sprocket-chains and adapted to hold capsule-molds in position on said table, an air-chamber through which said table travels, and a plurality of inlet and outlet openings alternately disposed, whereby opposite moving and impinging currents of air within said chamber are produced, substantially as and for the purpose described.

2. In a kiln for drying gelatin capsules, the combination of a traveling table composed of transverse plates secured to the links of sprocket-chains and adapted to hold capsule-molds in position on said table while traveling therewith, an air-chamber through which said table passes, a plurality of air inlets and outlets alternately disposed, a main supply-pipe connecting with said inlets, and means for forcing a current of air through the inlets into said chamber, substantially as and for the purpose described.

3. In a kiln for drying gelatin capsules, the combination of a traveling table composed of transverse plates mounted on sprocket-chains, an air-chamber through which the table travels, a plurality of air-inlets connecting with said air-chamber, air-outlets from said air-chamber located between the connections of said inlet-pipes, and means for forcing air through the inlets into said air-chamber and out through said outlets, whereby reversed air-currents are produced within said air-chamber, substantially as and for the purpose described.

4. In a kiln for drying gelatin capsules, the combination of an air-chamber, a plurality of air-inlets and air-outlets alternately disposed, connecting with said air-chamber, outlets from said air-chamber located between the connections of said inlets, a main supply-pipe connecting with said inlets, means for heating the air, means for forcing the heated air into said air-chamber, a traveling table composed of transverse plates mounted on sprocket-chains and provided with ribs adapted to locate capsule-molds and keep them in position on the table while traveling through the air, substantially as described.

5. In a kiln for drying gelatin capsules, the combination of an air-chamber, a plurality of air inlets and outlets alternately disposed, a main supply-pipe connecting with said inlets, regulating-valves adapted to control the air passing through the main supply-pipe, means for forcing the air into said air-chamber, the said inlets and outlets being adapted to produce currents which strike against the capsules alternately on opposite sides, substantially as described.

6. In a kiln for drying gelatin capsules, the combination with an air-chamber, and a movable table adapted to travel through it, means for controlling the starting movement of said table, consisting of a loose driving-pulley, a wheel engaging with the table-actuator, clutching mechanism between the driving-pulley and said wheel, a lever adapted to actuate the clutch mechanism, a pair of stops adapted to oppose the movement of said lever, one of which is arranged to be actuated from the delivery end and the other from the receiving end of said table, and both of which must be actuated before the clutching-lever can operate, substantially as and for the purpose described.

7. In a kiln for drying gelatin capsules, the combination of an air-chamber, a movable table adapted to travel through it, a loose pulley, a clutch adapted to engage the pulley, means for shifting the clutch, an arm on the driving-wheel, a stop adapted to engage the arm and to be shifted out of its detaining engagement therewith by the means which shifts the clutch, and to be shifted back to its detaining position by the arm on the driving-wheel, substantially as described.

8. In a kiln for drying gelatin capsules, the combination of a traveling table composed of transverse plates mounted on sprocket-chains, an air-chamber through which the table travels, an air-inlet, and air-outlets on either side of said air-inlet, and means for forcing air through said inlet into said air-chamber and out through said outlets, whereby reversed impinging air-currents are produced within said air-chamber, substantially as and for the purpose described.

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

FREDERICK A. HUBEL.
JESSE M. SMITH.

Witnesses:
CHARLES F. BURTON,
FRANCES CLOUGH.