

No. 705,158.

Patented July 22, 1902.

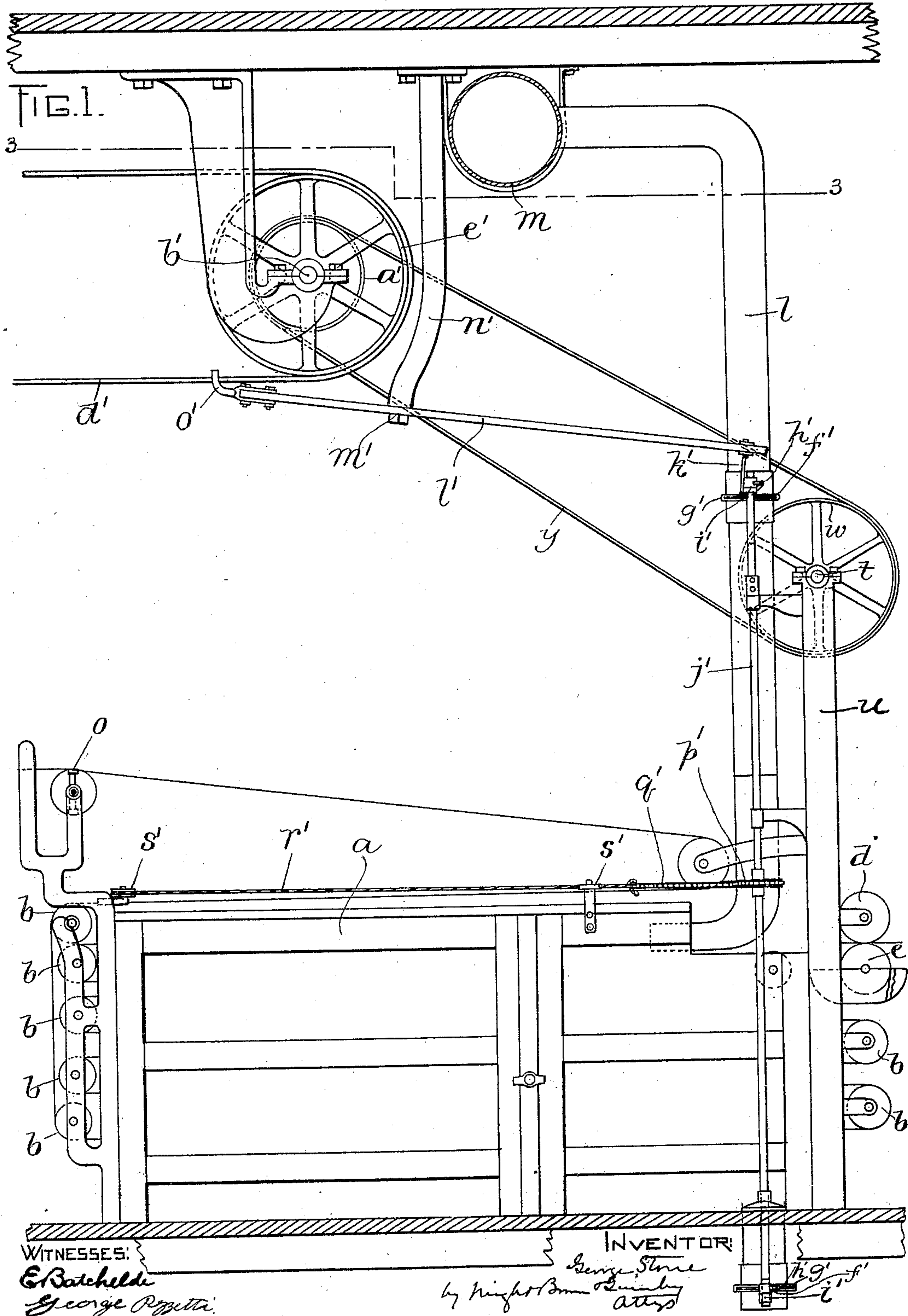
G. STONE.

YARN DRYING APPARATUS.

(Application filed Aug. 15, 1901.)

(No Model.)

7 Sheets—Sheet 1.



WITNESSES:

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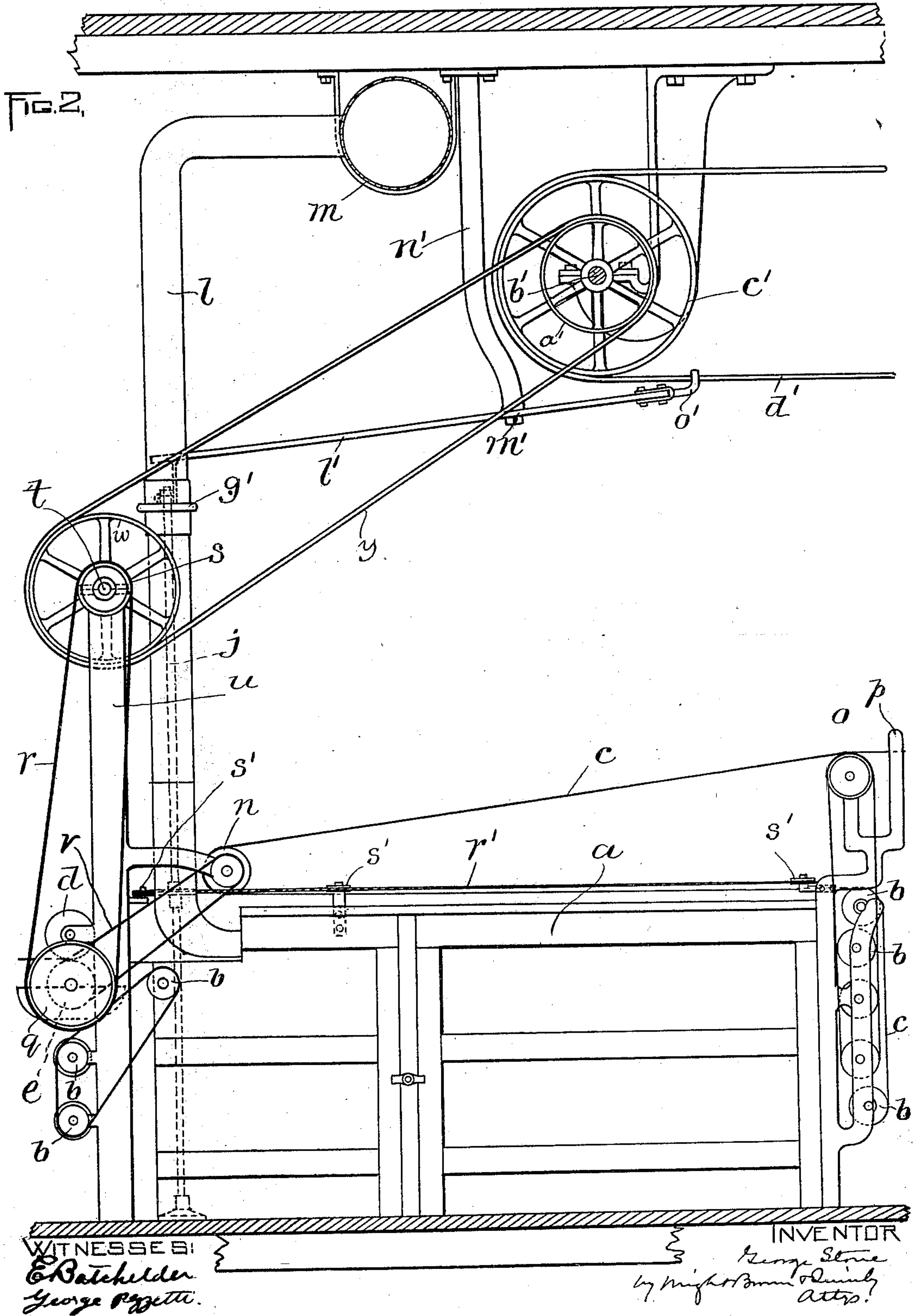
George Stone
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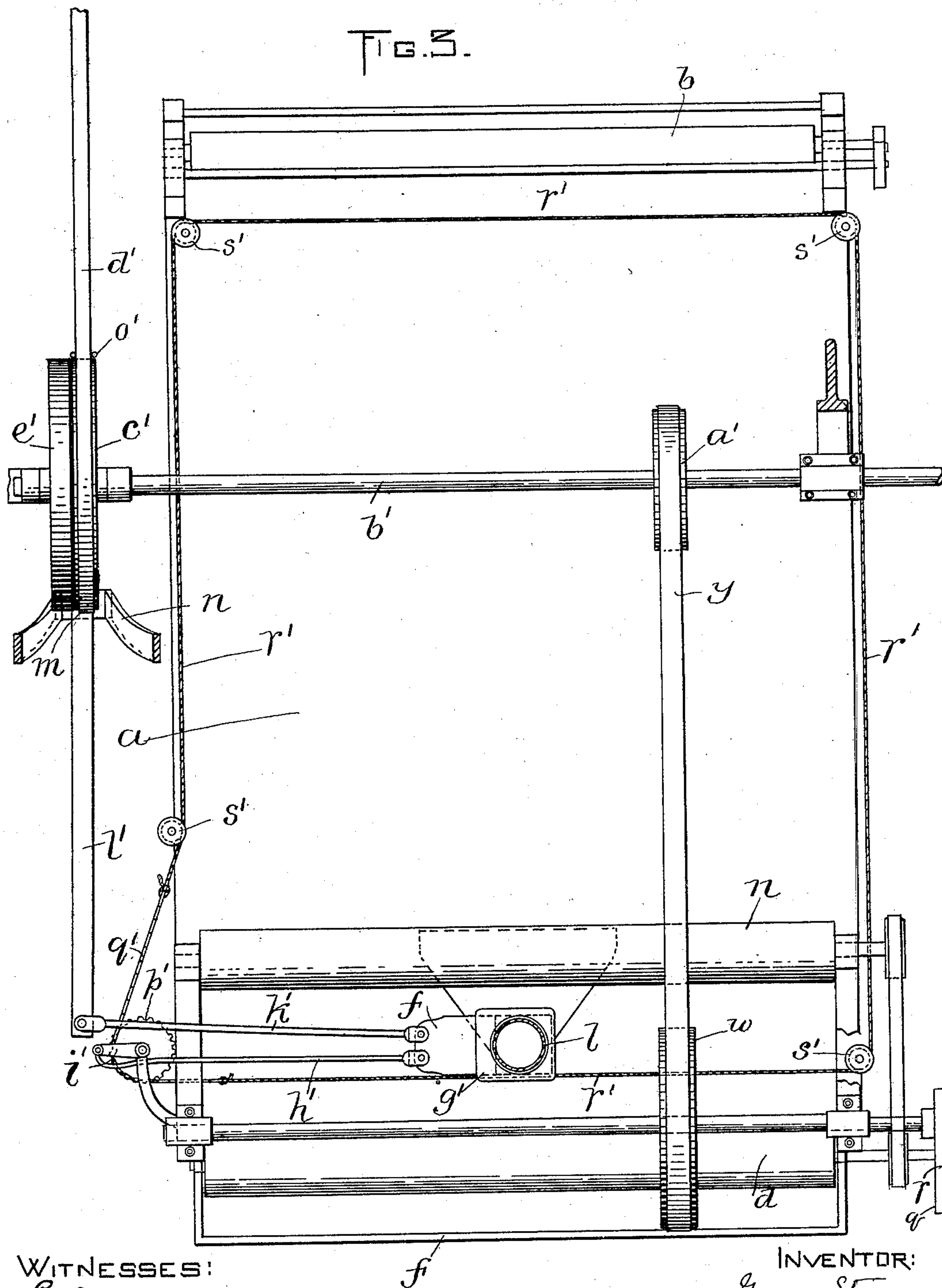


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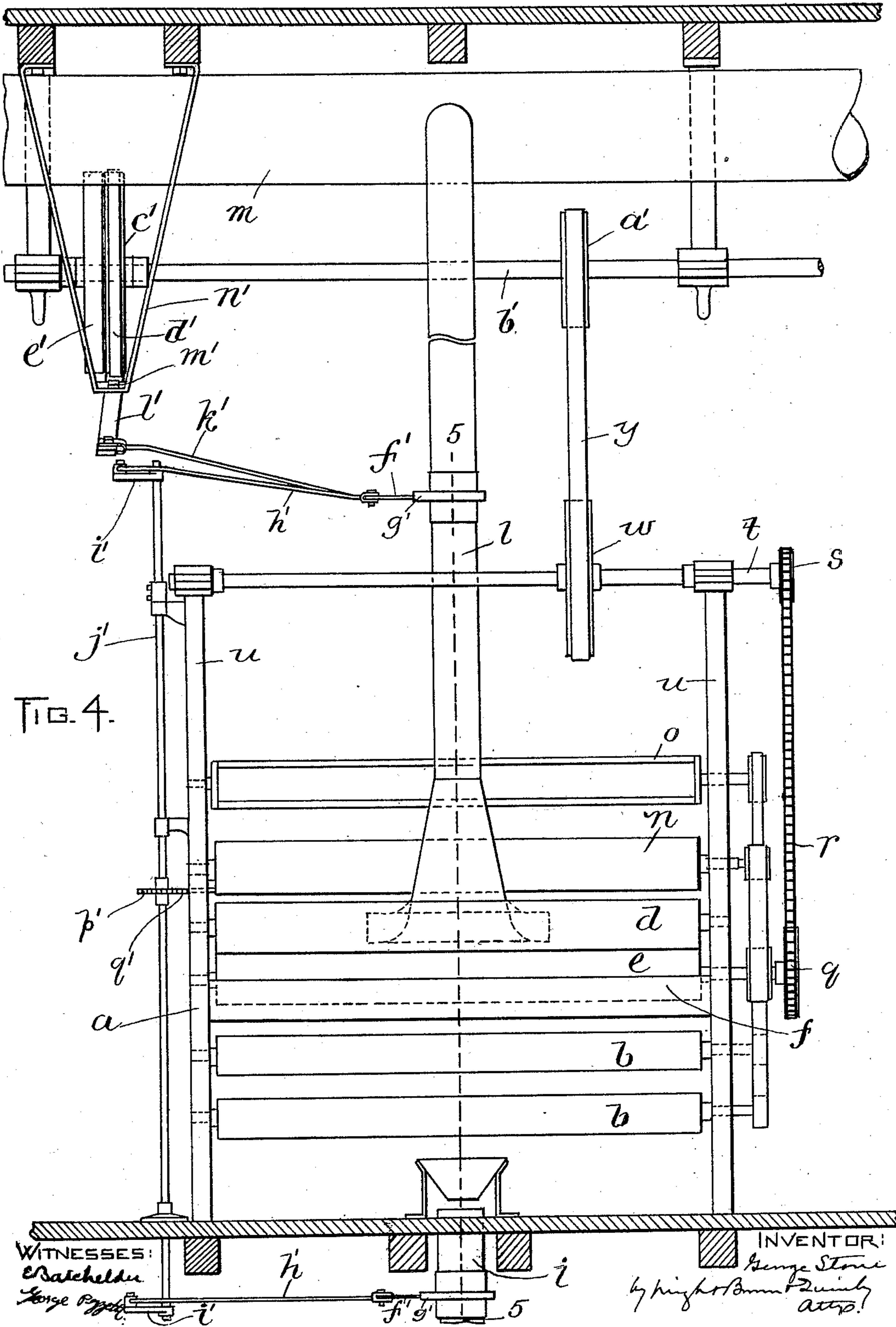
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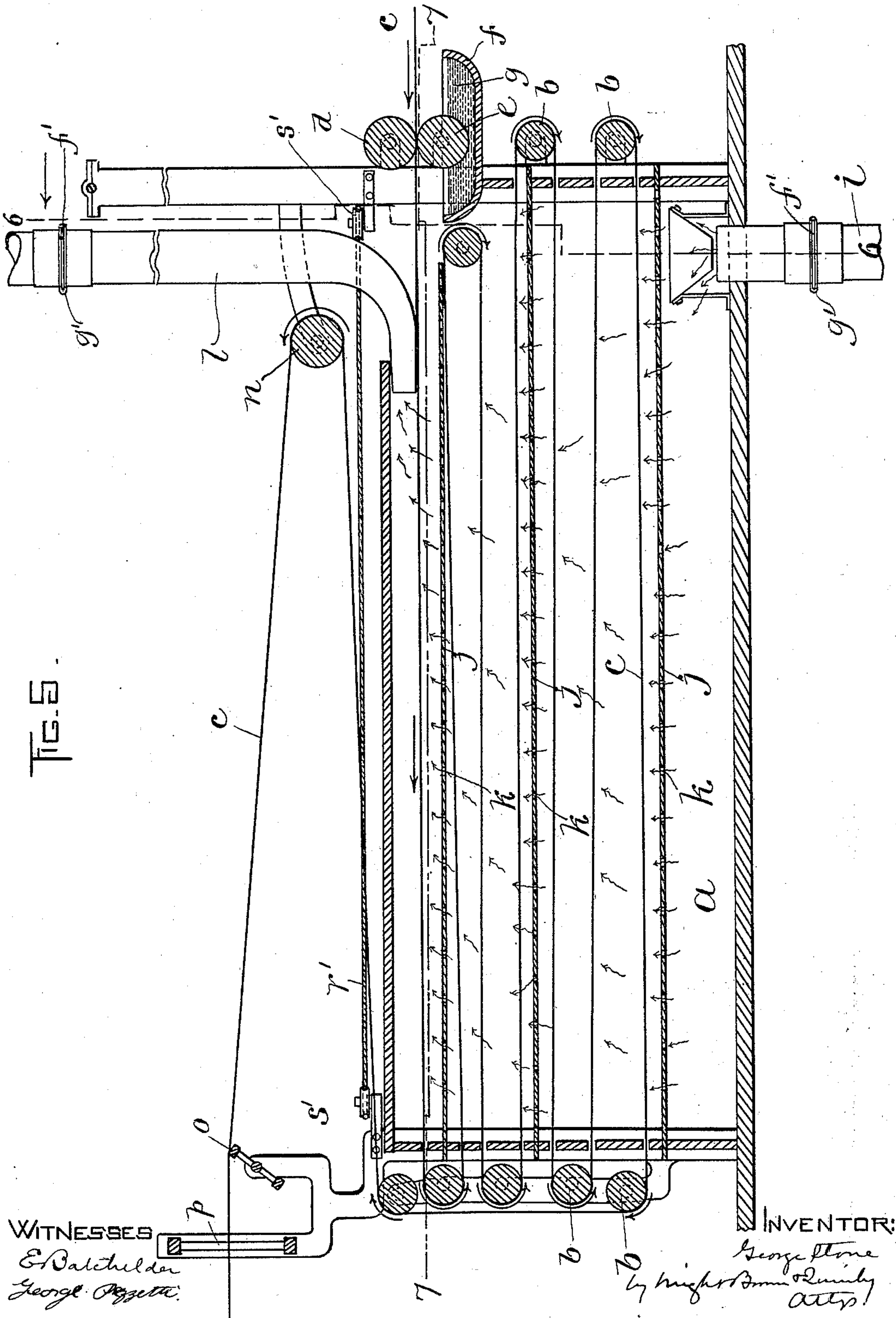


G. STONE.
YARN DRYING APPARATUS.

(Application filed Aug. 15, 1901.)

(No Model.)

7 Sheets—Sheet 5.



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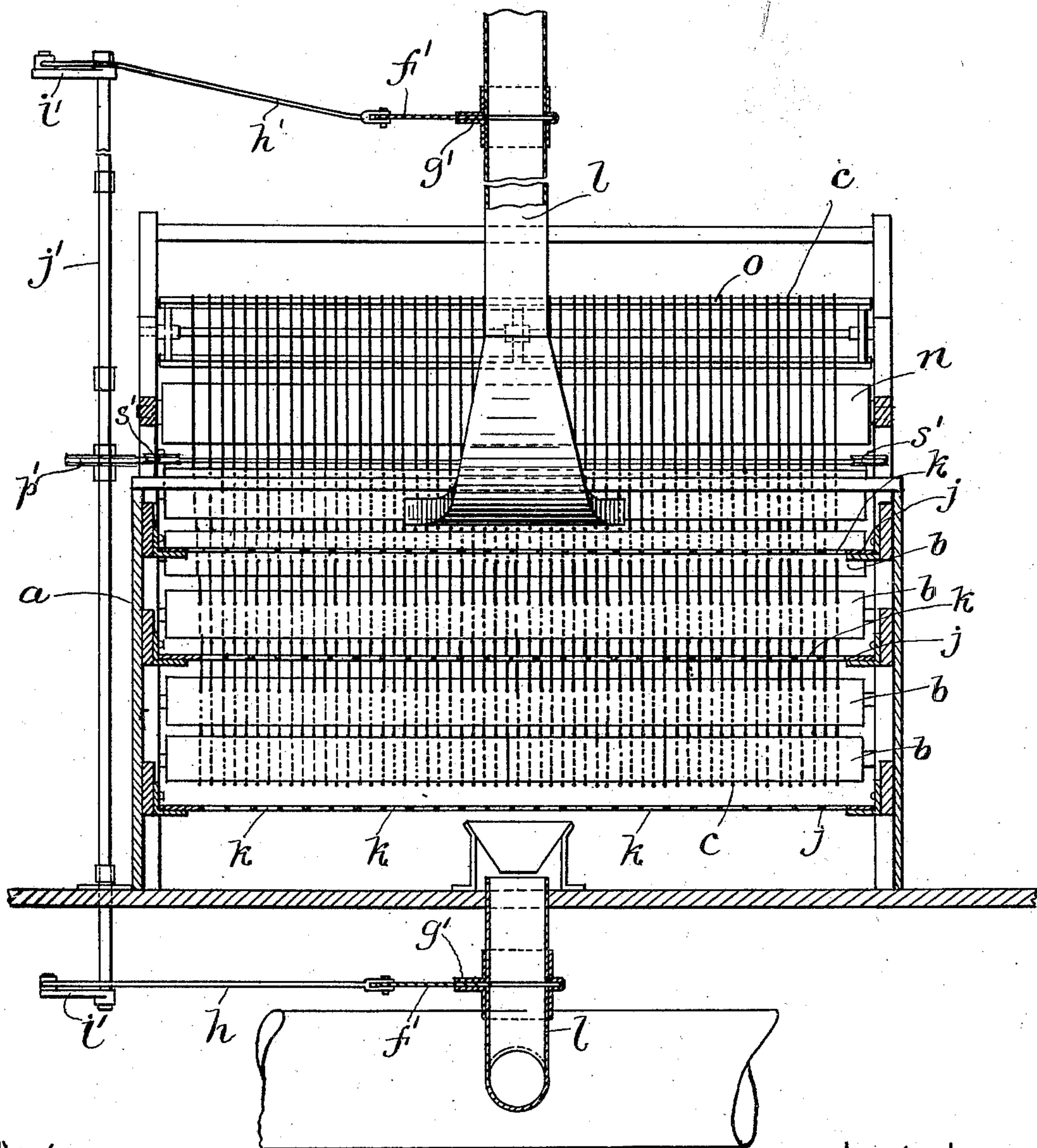
G. STONE.
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(Application filed Aug. 15, 1901.)

(No Model.)

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FIG. 6.



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No. 705,158.

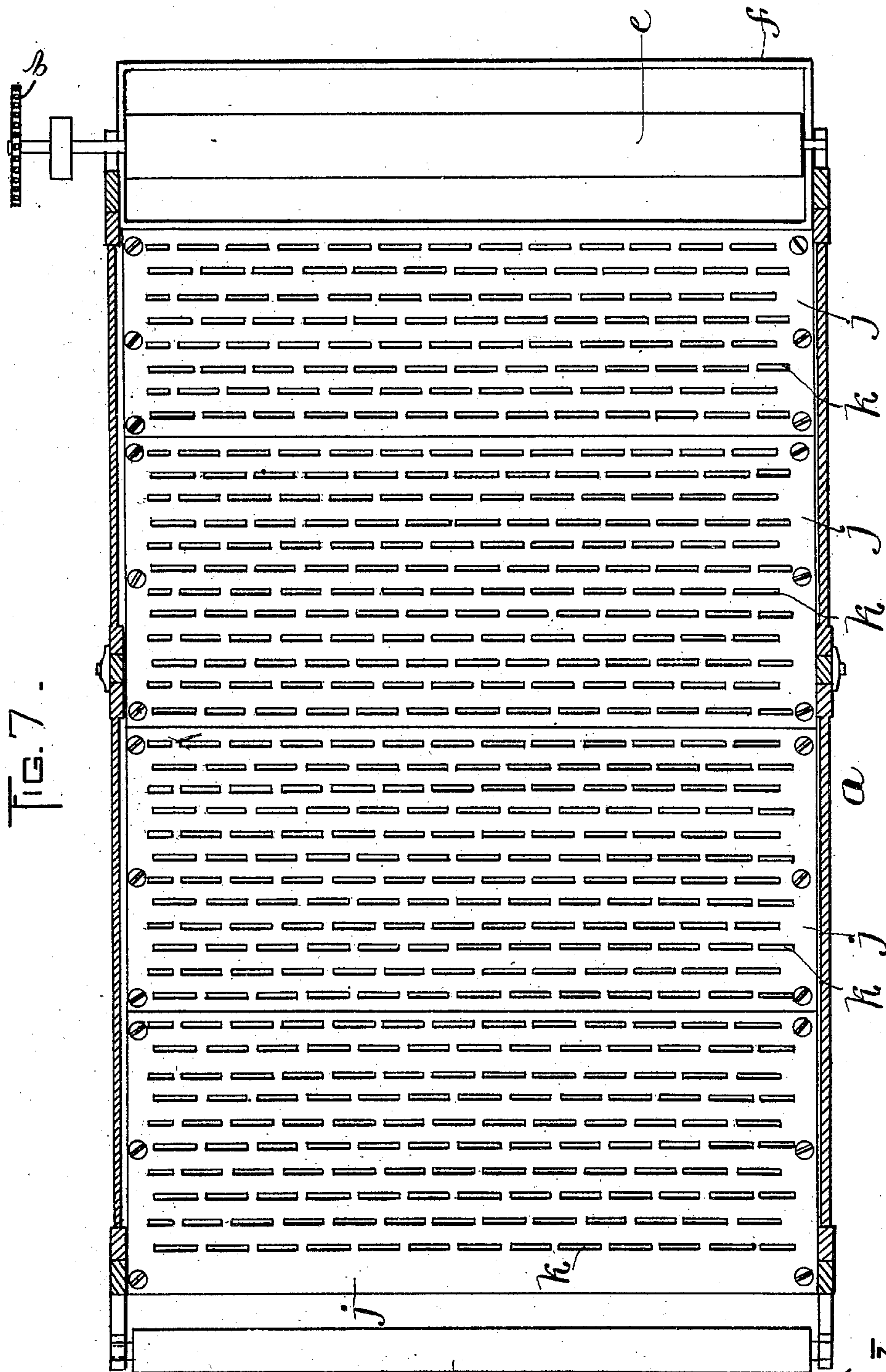
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7 Sheets—Sheet 7.



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UNITED STATES PATENT OFFICE.

GEORGE STONE, OF NORTH ANDOVER, MASSACHUSETTS, ASSIGNOR TO M. T. STEVENS AND SONS, OF NORTH ANDOVER, MASSACHUSETTS.

YARN-DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 705,158, dated July 22, 1902.

Application filed August 15, 1901. Serial No. 72,149. (No model.)

To all whom it may concern:

Be it known that I, GEORGE STONE, of North Andover, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Yarn-Drying Apparatus, of which the following is a specification.

This invention relates to apparatus for drying yarn which has been treated with a sizing or dressing composition; and it has for its object to provide improved means for drying the sized yarn and for controlling the heating medium in such manner as to prevent liability of overexposure of the yarn to the heating medium and the consequent discoloration of the same.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of my improved yarn-drying apparatus, parts being shown in section. Fig. 2 represents an elevation of the opposite side of the apparatus from that shown in Fig. 1. Fig. 3 represents a section on line 3 3 of Fig. 1 looking downwardly. Fig. 4 represents an end view of the apparatus. Fig. 5 represents a longitudinal section on the line 5 5 of Fig. 4. Fig. 6 represents a horizontal section on line 6 6 of Fig. 5 looking from the right. Fig. 7 represents a sectionalized plan on the line 7 7 of Fig. 5.

The same letters of reference indicate the same parts in all the figures.

It has heretofore been the practice in machines of this class to pass the yarn through the sizing-rolls and then over pipes filled with steam to dry the sizing upon the yarn. The frequent breaking of the yarn as it passes through the machine necessitates stopping of the driving-machine in order to join or "piece" the broken strand. The stopping of the machine exposes the yarn to the heat of the steam-pipes for a protracted period, so that the yarn becomes overdried in sections, for the reason that the heat from the steam-pipes cannot be controlled in the brief stops that are made.

In carrying out my invention I provide means for drying the yarn by hot air under

pressure supplied to the machine from a suitable heater and for controlling the hot air, so that it is uniformly distributed and acts evenly on all parts of the yarn. I also provide means for shutting off the heat from the yarn whenever the movement of the latter is arrested and for admitting the heat to the yarn whenever the movement is resumed.

In the drawings, *a* represents the casing or frame of the machine, which is provided with rolls *b*, journaled in bearings on the frame. Said rolls are provided for the support and passage of the yarn *c* through the machine. The yarn is taken from any suitable supply and is usually unwound from a reel or spool (not shown) and passed between two rolls *d* *e*, located at one end of the upper portion of the casing. The roll *e* is partially immersed in a tank or trough *f*, which contains a suitable sizing mixture *g*, which is imparted to the yarn by the roll *e*, and the surplus is pressed out of the yarn by the roll *d*, which is arranged to bear upon the roll *e*. (See Fig. 5.)

The yarn passes from the rolls *d* and *e* over the rolls *b* back and forth in a sinuous downward course through the casing *a*, and it is exposed to a current of heated air which is supplied to the casing *a* by any suitable means, preferably by a blower passing the outer air over coils of steam-pipes and through a blast pipe or conduit *i* into the lower portion of the casing. The casing is provided with horizontal partitions *j*, having perforations *k*, which are preferably narrow elongated slots, as shown in Fig. 7. The heated air passes through the said perforations, and is thus evenly distributed and caused to pass uniformly through the horizontal stretches of the yarn and in a direction substantially at right angles to said stretches.

l represents an exhaust pipe or conduit having a widened receiving end *l'*, which enters the upper portion of the casing above the upper horizontal stretch of yarn. Said exhaust-pipe is adapted to withdraw the heated and moisture-laden air from the upper portion of the casing and maintain a proper upward current of the heated air through the stretches of yarn. The exhaust-pipe *l* is connected with a main pipe *m*, which may be connect-

ed with the exhaust-pipes *l* of a plurality of driers and is connected with an exhaust-fan or other suitable apparatus (not shown) to create a sufficient vacuum in the pipes *m* and *l* to draw the heated air from the casing *a*. The exhaust apparatus prevents the escape of the heated air through the various openings adjacent to the yarn-guiding rolls and coöperates with the perforated partitions *j* in controlling the supply of heated air and confining it to the area containing the horizontal stretches of yarn.

After the yarn has been dried it passes out of the lower portion of the casing over rolls *n n'* and a "vibrator" *o* through a reed *p* to a suitable winding apparatus. (Not shown.) It will be observed that the freshly-sized yarn enters the upper portion of the casing and progresses in a downward direction through the casing, emerging in a dried condition from the lower portion. The yarn is therefore effectively dried, because the moisture is continuously carried upwardly from the supply of dry air, each stretch of yarn from the top downwardly being subjected to drier air than the stretch above it, the final stretch being subjected to dry air that has not been affected by the moisture evaporated from the yarn.

The means for simultaneously stopping and starting the circulation of hot air and the movement of the yarn will now be described.

The roll *e* is provided upon one end with a sprocket-wheel *q*, which is provided with a chain *r*, which engages a sprocket-wheel *s* upon a shaft *t*, journaled in bearings on standards *u*, formed on the frame of the machine. The roll *n* is also driven from the shaft of roll *e* by a belt *v*, engaging a pulley upon said shaft and roll, as shown in Fig. 2. The rolls *b* are idle and are rotated by the contact of the yarn therewith, as is the usual practice in this class of machines.

The shaft *t* has a pulley *w*, which pulley is connected by a belt with a pulley *a'*, mounted upon a shaft *b'*. Said shaft has a pulley *c'*, which is connected by a belt *d'* with a pulley on the main shaft. (Not shown.) The belt *d'* is adapted to drive either the pulley *c'*, which is tightly secured to the shaft *b'*, or it may engage the pulley *e'*, which is loosely arranged upon the shaft by the following means: By reference to Figs. 4 and 6 it will be seen that the pipes *i* and *l* are provided with dampers *f' f'*, adapted to move in suitable guides *g' g'*. Said dampers are of sufficient area to close the pipes and prevent the passage of air therethrough. To the outer end of each of the dampers *f'* is connected a rod *h'*. The said rods are connected to arms *i' i'* upon a vertical rod *j'*, journaled in bearings on one of the standards *u*. *k'* represents a rod secured at one end to the upper damper *f'* and at the other end to one end of a shipper-lever *l'*. Said lever is pivoted at *m'* to a hanger *n'*, suitably secured to the supports of the upper flooring. The other end of the

shipper-lever is provided with a fork *o'*, adapted to engage the belt *d'*. The vertical rod *j'* is provided with a sprocket-wheel *p'*, adapted to be engaged by a sprocket-wheel chain *q'*, the ends of which are connected with a rope or cord *r'*, supported by guide-rolls *s'*, the arrangement being such that the operator may have convenient access to said rope at various points when he desires to operate the dampers and the belt-shipper. It will be seen that the belt-shipper is operated by the movement of the upper damper, and when the dampers are open to admit the heated air to the yarn the latter will be in motion, because the act of opening said dampers causes the driving-belt to be thrown upon the tight pulley and starts the machine, and when it is necessary to stop the machine the action of the shipper throws the driving-belt upon the loose pulley, causing the machine to stop and at the same time closing the dampers, so that the heated air is kept from the yarn.

The following useful results are obtained by my invention: In warm weather air may be supplied to the casing at its natural temperature without being artificially heated, the circulation and effective distribution of the air being insured by the conjoint action of the blast, the exhaust, and the intermediate air-distributing perforated partitions. The air withdrawn from the casing by the exhaust may be utilized for ventilating the portion of the mill or factory in which the apparatus is located and for heating the same when the air-supply is artificially heated. The effective distribution and circulation of the air enables the yarn to be dried at a relatively low temperature of from 150° to 160° Fahrenheit, thus economizing heat and preventing liability of discoloration of the yarn by excessive heat. The described shutting off and turning on of the air-supply when the yarn is stopped and started not only prevents overexposure and discoloration of the yarn when its motion is discontinued, but also economizes heat. I am enabled to use one heater, one blower, and one exhaust-fan for a number of machines, so that the cost of the heating and air-circulating apparatus is less than would be the case if a separate heater were required for each machine or drier.

My invention is not limited to the details of mechanism here shown, and the same may be variously modified without departing from the spirit of the invention.

Having thus explained the nature of the invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. A yarn-drying apparatus comprising a casing, rolls located at opposite ends of the casing and arranged to conduct yarn there-through in a sinuous course and in a series of stretches, means for forcing air under pres-

sure into the casing at one side of the series of stretches, means for exhausting air from the casing at the opposite side of the series of stretches, and intermediate means between the stretches for distributing the air in its passage through the casing.

2. A yarn-drying apparatus comprising a casing, rolls located at opposite ends of the casing and arranged to conduct yarn there-through in a sinuous course and in a series of stretches, means for forcing air under pressure into the casing at one side of the series of stretches, means for exhausting air from the casing at the opposite side of the series of stretches, and fixed perforated partitions located in the casing substantially parallel with and between the said stretches, whereby the air is distributed.

3. A yarn-drying apparatus comprising a casing, rolls located at opposite ends of the casing and arranged to conduct yarn in a sinuous course and in a series of stretches through the casing, perforated partitions located in the casing and extending substantially parallel with and between stretches of yarn therein, means for forcing air under pressure into the casing at one side of the series of stretches, and means for exhausting air from the casing at the opposite side of the series of stretches.

4. A yarn-drying apparatus comprising a casing, means for conducting yarn there-through in a sinuous course and in a series of substantially parallel stretches, means for applying sizing to the yarn at or near the locality where it enters the casing, a blast-conduit arranged to deliver air under pressure to the casing at one side of the series of stretches, the air delivered by said conduit impinging first against the stretches which are farthest from the locality where the sizing is applied, and an exhaust-conduit arranged to draw air from the casing at the opposite side of the series of stretches, the receiving end of the exhaust-conduit being adjacent to the freshly-sized stretches.

5. A yarn-drying apparatus comprising a casing, means for conducting yarn there-through in a sinuous course and in a series of stretches, a conduit for delivering air under pressure to said casing, and means for stopping and starting the movement of the yarn through the casing and for closing and opening said conduits simultaneously with the stopping and starting of the yarn, substantially as described.

6. A yarn-drying apparatus comprising a casing, means for conducting yarn there-through in a sinuous course and in a series of stretches, a conduit for delivering air under pressure to said casing, an exhaust-conduit for removing air from the casing, and means for stopping and starting the movement of the yarn through the casing and for closing and opening said conduits simultaneously with the stopping and starting of the yarn, substantially as described.

7. A yarn-drying apparatus comprising a casing, means for conducting yarn there-through in a sinuous course, an air-supply or blast conduit arranged to deliver air to the casing, a valve or damper in said conduit, yarn-impelling mechanism including a driving-shaft having a fast pulley and a loose pulley and a belt adapted to run on either of said pulleys, a shipper for said belt, and connections between said shipper and damper whereby the damper and shipper may be simultaneously operated.

8. A yarn-drying apparatus comprising a casing, means for conducting yarn in a sinuous course therethrough, an air-supply or blast conduit and an exhaust-conduit each communicating with the casing and each having a valve or damper, yarn-impelling mechanism including a driving-shaft having a fast pulley and a loose pulley, and a belt adapted to run on either pulley, a shipper for said belt and connections between said shipper and the dampers of said conduits whereby said dampers and shipper are simultaneously operated.

9. A yarn-drying apparatus comprising a casing, means for conducting yarn there-through in a sinuous course, yarn-impelling mechanism including a driving-shaft having a fast pulley and a loose pulley and a belt adapted to run on either of said pulleys, a shipper for said belt, an air-supply or blast conduit arranged to deliver air to the casing, a valve or damper in said conduit, and a damper and shipper operating mechanism including an elongated flexible cord accessible at different points, and connections between said cord and the damper and shipper.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGE STONE.

Witnesses:

NEWTON P. FRYE,
KATE C. FRYE.