

(No Model.)

J. WHARTON.

Process of and Apparatus for Hat Felting.

No. 240,870.

Patented May 3, 1881.

Fig. 1.

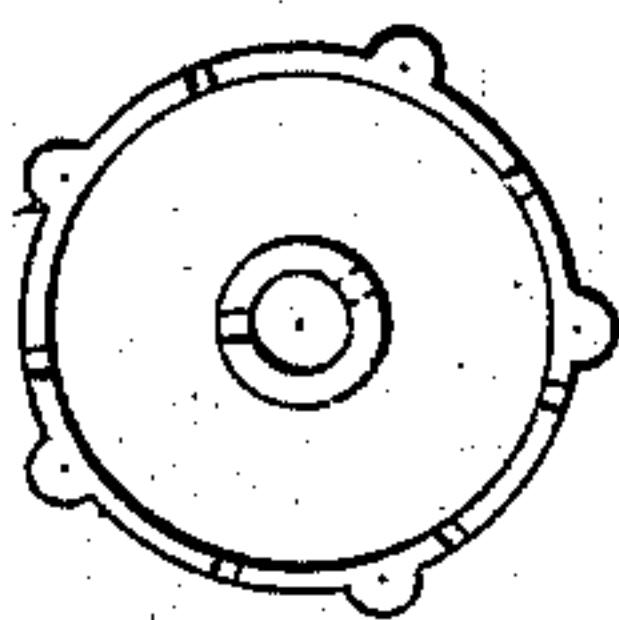


Fig. 2.

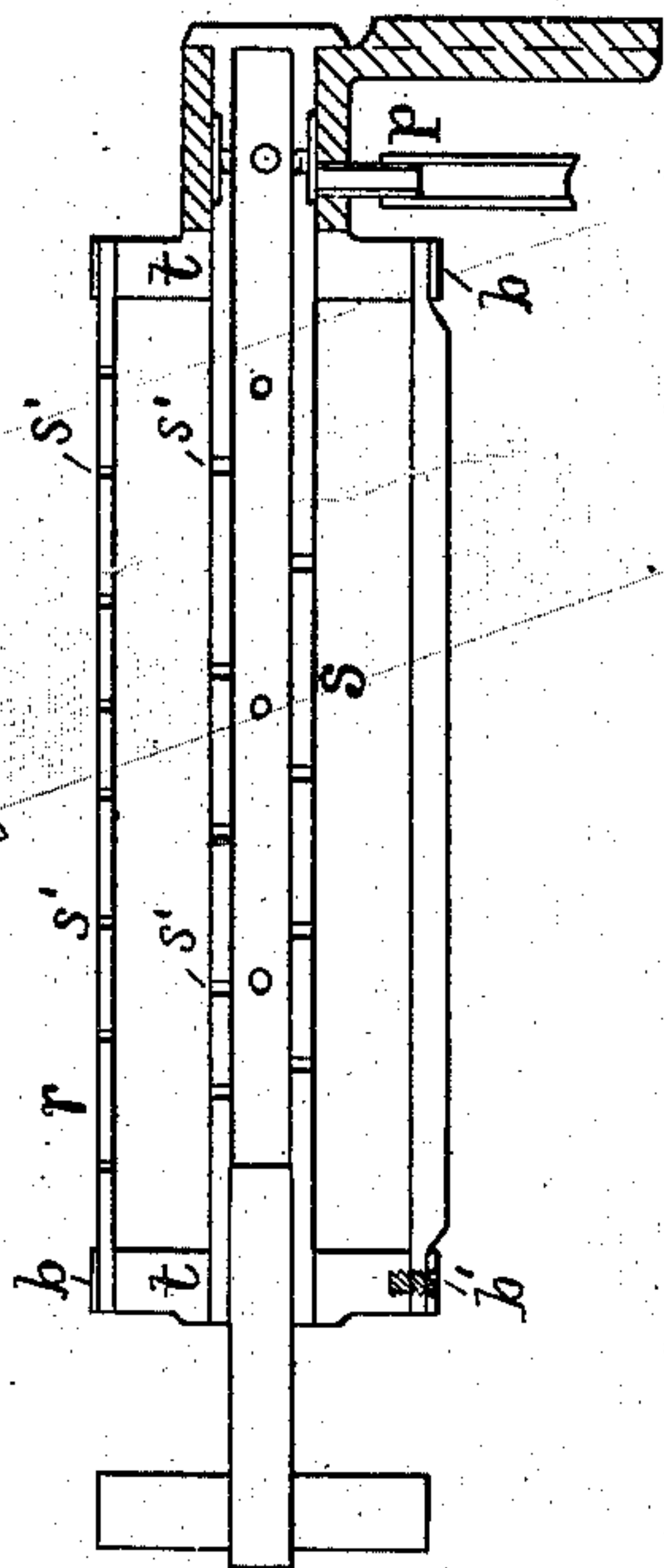


Fig. 3.

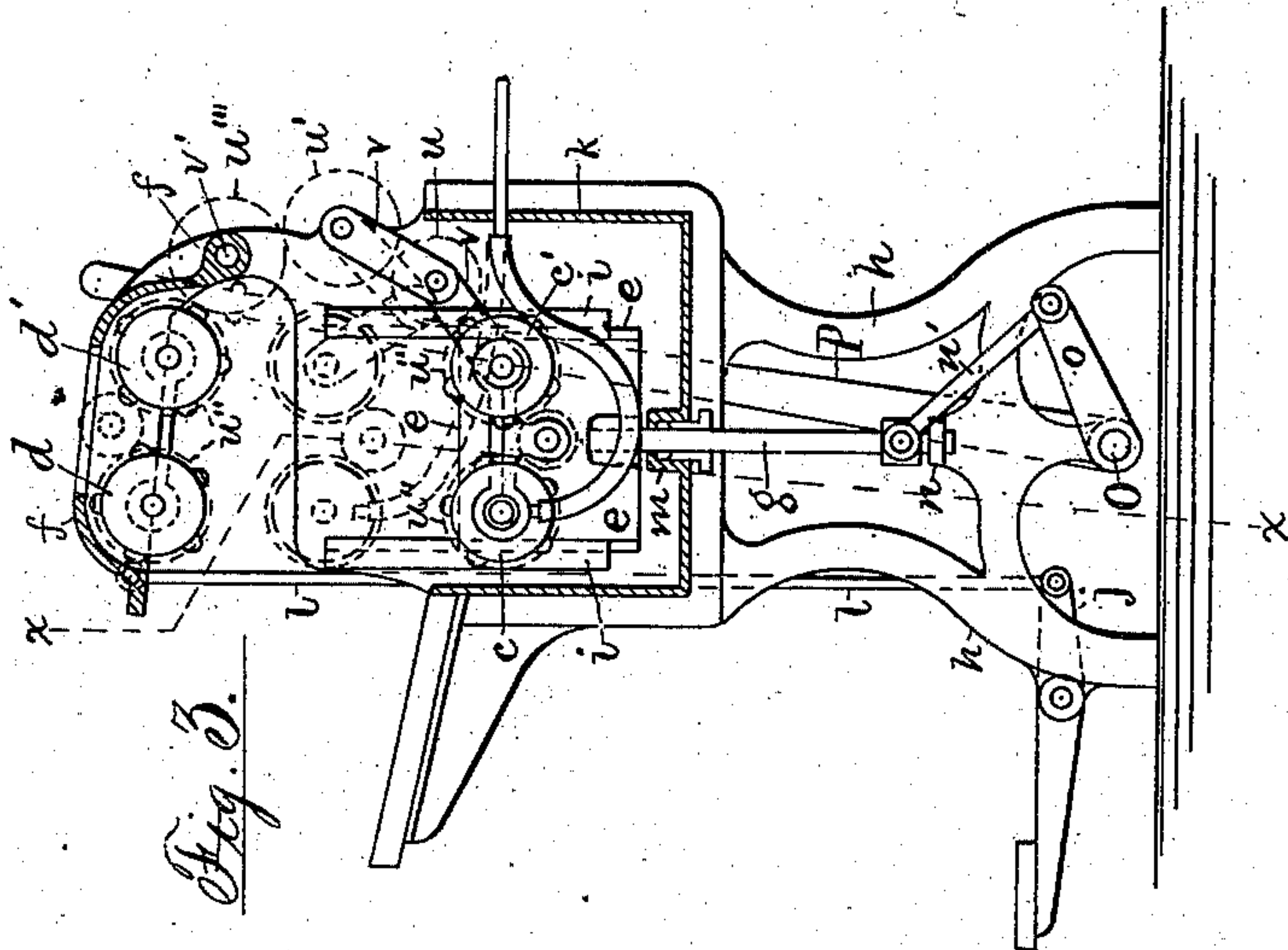


Fig. 4.

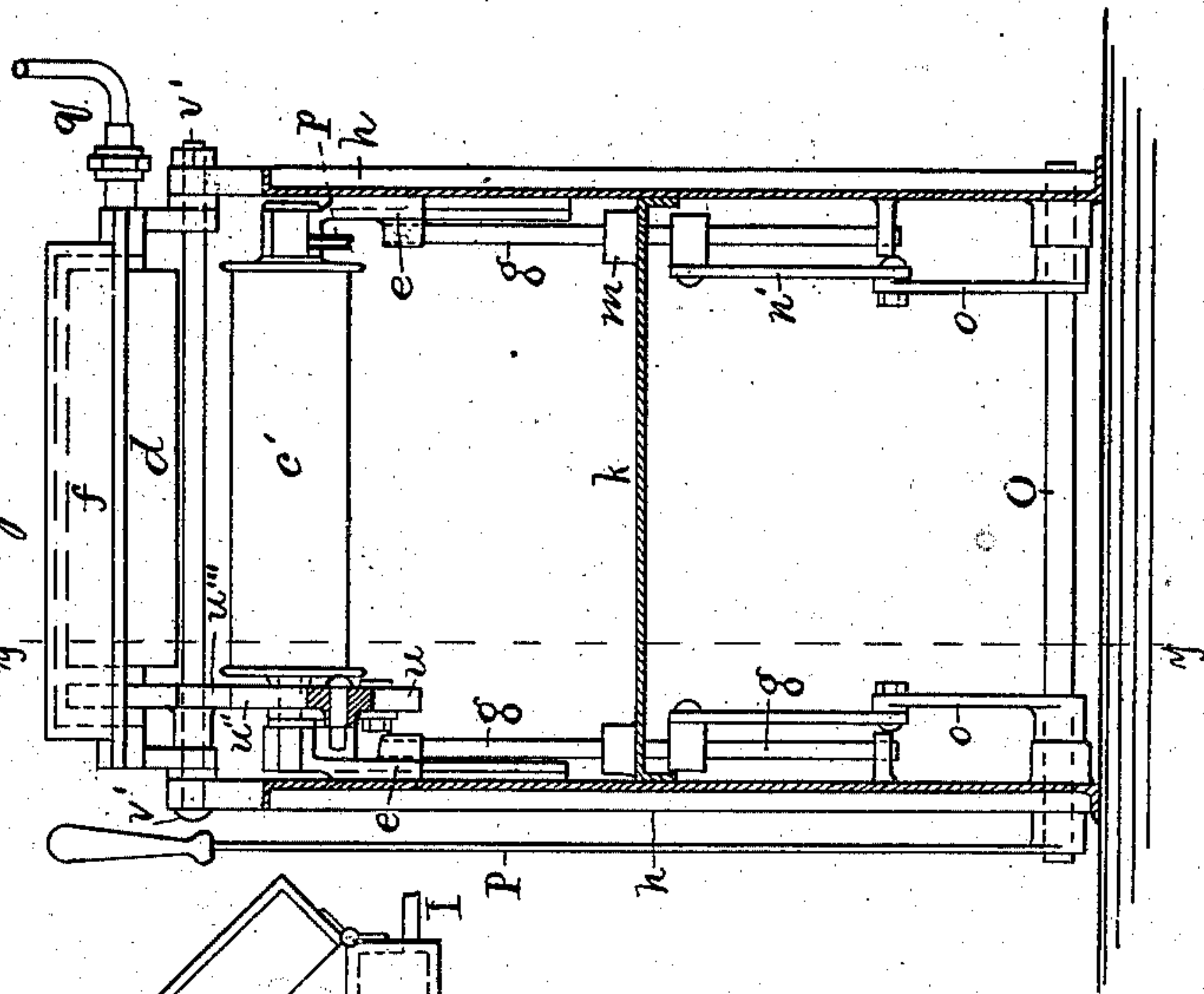
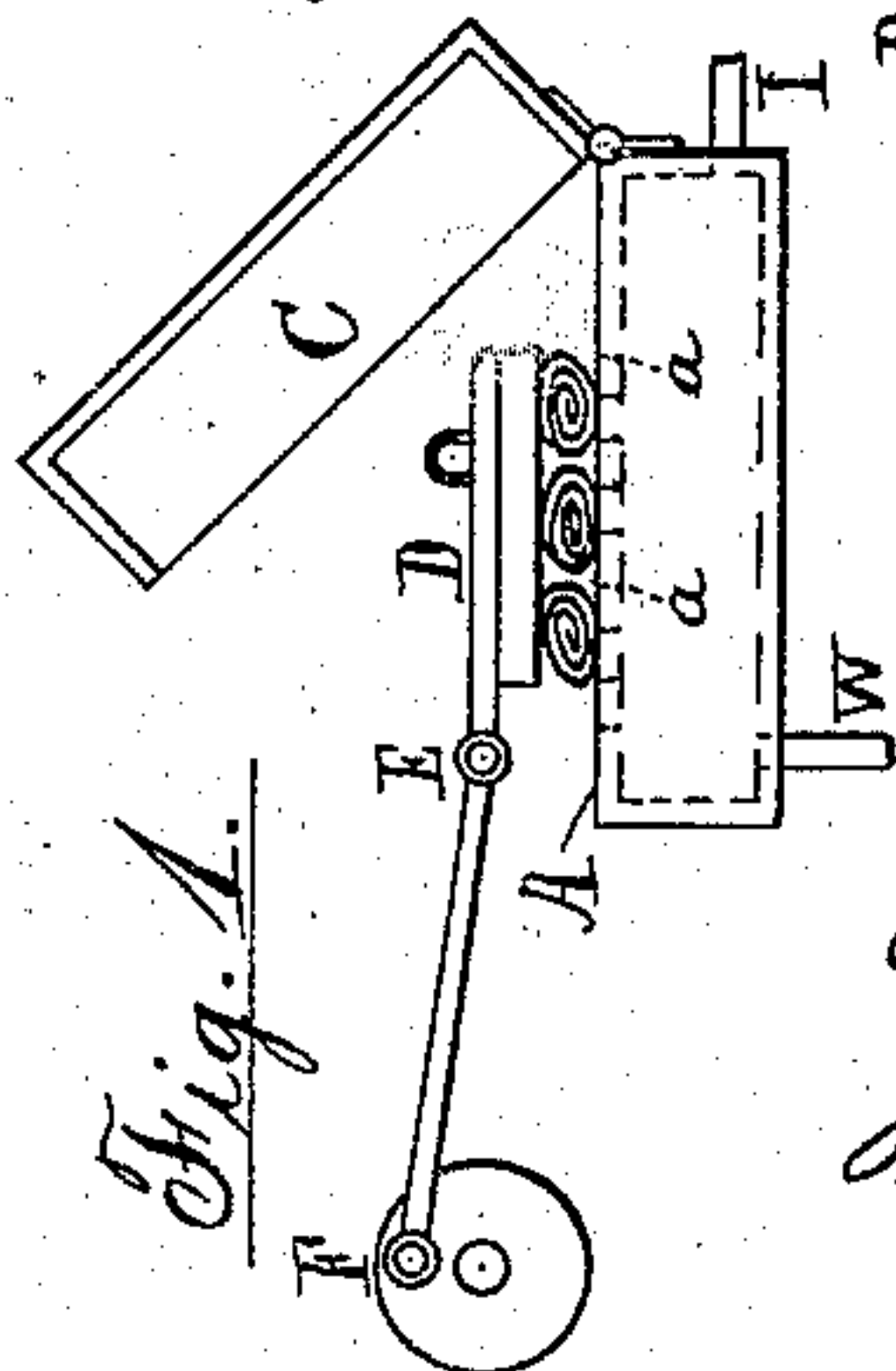


Fig. 5.



Attest:

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UNITED STATES PATENT OFFICE.

JOHN WHARTON, OF NEWARK, NEW JERSEY.

PROCESS OF AND APPARATUS FOR HAT-FELTING.

SPECIFICATION forming part of Letters Patent No. 240,870, dated May 3, 1881.

Application filed February 5, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN WHARTON, of Newark, in the county of Essex and State of New Jersey, have invented a new and useful
5 Improvement in Processes of and Apparatus for Hat-Felting, of which the following is a description.

This invention is the same as that set forth in a caveat filed by me in the United States
10 Patent Office on the 5th day of February, 1880, wherein the invention was stated as follows:

"This invention relates to that class of felts composed of mixed hairs, and is designed to
15 obviate the difficulty of hardening and shrinking a mass of fibers having different previous preparation, and consists in subjecting the newly-formed felt to friction while hot and damp, instead of working it cold, as is done at
20 present.

"It also consists in a special device for heating and moistening the felt during the hardening process.

"The necessity of my invention and its effect
25 in hastening the hardening of the new felt will be best understood by describing the process as applied to the manufacture of hats, the fur for which is imported from all parts of the world, and is variously prepared for felting
30 before it is sent to market.

"Many fur fibers will not form a hat felt or body at all unless treated with a solution of nitrate of mercury, which is often applied before the fur is cut from the skin, and fur thus
35 treated with the nitrate or 'carrot,' so called, is constantly used in the manufacture of hat-bodies mixed with fur containing no carrot, and with fibers of silk, cotton, and other materials.

"To make a large lot of hats of uniform quality, the different fibers are thoroughly mixed, and after forming into bodies have hitherto required the most careful treatment by hand to fit them for the felting operation afterward.
40 In this preparatory 'hardening' the carroted fibers display a strong tendency to felt, and often shrink away from the other ingredients of the felt, making a very imperfect fabric.

"I have discovered that the application of
50 a hot moist vapor (like that from a steam-jet) to the web or body at this stage of the manu-

facture has the effect of diffusing the carrot or its effect upon the fibers through the entire body of the web, and causing the uncarroted fibers to interlock and shrink with the others
55 in the desired manner. I have therefore devised the apparatus shown in the drawings, by which the hot vapor can be applied in the right degree as the web is gradually hardened."

Since the filing of the above description I have devised an apparatus for combining the preparatory hardening process with the later
60 felting operations, and have shown the same in the accompanying drawings, Figure 1 showing a side elevation, partly in section, of the device represented in the said caveat, and
65 Figs. 2, 3, 4, and 5 the improved machine for the purpose last mentioned.

The device shown in Fig. 1 was thus described in the caveat:

"The device consists, essentially, of a perforated table supplied with steam, to issue from the holes upon its surface, and a cover or box,
70 to inclose the hat-bodies in the vapor when they have been partially hardened by the action of the vapor and friction upon the open table.

"A is the hot table, made by inclosing perforated steam-pipes in a metallic or wooden box
80 having perforations *a a* upon its surface.

"C is the cover, of box form, and arranged to lift off of the table readily, to expose the top.

"I is the steam-inlet pipe, and W a waste-
85 pipe, both of which would be supplied with cocks to regulate the steam.

"The method I employ with this apparatus is as follows: I lay a cloth upon the table, over the perforations supplied with steam-vapor,
90 and fold up a number of hat-bodies in the cloth, then apply gentle friction and a moderate degree of heat and moisture until the combined action of the hand-rubbing and the vapor have partially hardened the felt. I then
95 lower the box-cover, so as to inclose the bundle in the vapor, and turn on sufficient steam to heat the bodies quite hot. This has the effect of equalizing the action of the carrot upon the different fibers in the felt, and when it has
100 been continued a few seconds I raise the cover again and apply a mechanical rubber or 'jig-

ger' to the felt, to give them a degree of friction not attainable by hand, and thus secure the utmost advantage from the rapidity with which my process causes the fabrics to felt.

5 "This device is shown in operation upon the bundle of felt, the jigger D being merely a rubbing-block, of suitable weight, connected at E with a driving-crank, F, which reciprocates rapidly when desired.

10 "From the above description it will be seen that my process consists in first subjecting the new web to a moderate degree of heat and moisture while it is rubbed with the hand until able to bear a little rougher treatment, and then
15 steaming the same throughout and rubbing it by mechanical means to harden the web more rapidly than it can be done by hand. The dependence of these operations upon one another may be seen from the fact that a web hardened
20 without the aid of the hot moist vapor will not bear the violence of any mechanical rubbing, (applied during the primary hardening process,) while the advantages of diffusing the carot throughout the web are only fully gained
25 by using machinery in the place of hand-labor to shorten the process in the greatest degree. The form of table, cover, and mechanical rubber that may be employed are not essential, as the operation will produce the required effect, if conducted as described, with any suitable means."

From the above-quoted description it will be seen that I distinguished a difference between the common mode of hardening felt by
35 dipping in hot water or sprinkling therewith, and then rubbing the felt while the temperature rapidly decreased, and working or rubbing the same in the continued presence of a hot moist vapor adapted to maintain a uniform heat in all parts of the felt until the desired effect was produced. The importance of this may be judged from the fact that three felts are often dipped in one bundle at the same time, and that the one first removed from
45 the bundle and hand-worked will block half a size smaller than those later handled, because the change in the temperature of the bundle retards the progress of the felting operation upon the latter felts. I also recognized the fact
50 that too great a steam-heat at first would cause the carotted fibers to shrink too rapidly, and form an imperfect union with the remainder of the web. I have therefore devised a machine adapted to apply all these principles to the
55 hardening and sizing of a felt, constructing it to displace hand-labor almost entirely, even in the first handling of the new and tender felts. To secure these objects I have made modifications in the well-known roller-machine already
60 in general use for the second sizing operations, but never adapted hitherto for any of the earlier "hardening processes," so called.

Fig. 2 of the drawings shows a front elevation, in section, of a four-roller machine supplied with my improvements, the section being taken on line *x x* in Fig. 3. Fig. 3 is a

transverse sectional view of the same, taken on line *y y* in Fig. 2. Fig. 4 is an enlarged longitudinal section of the lower front roller, and Fig. 5 is a transverse section of the same roller on line *y y* in Fig. 2.

The improvements consist, first, in making one or more of the rollers hollow, forming it with perforations upon the surface to distribute steam against the bundle of felts, and providing a steam-connection to the roller, whereby the steam may be admitted in any desired degree; second, in making the rollers of such a character that the surface will yield when the felts are laid between them, and a more
75 equable pressure be produced than is possible with the curved ribs now employed upon hard rollers; third, in forming ribs of india-rubber upon the exterior of a hollow rubber cylinder and perforating the cylinder to distribute steam
80 admitted through a hollow axle. By these expedients I am able to carry a hat-body through nearly every stage of the felting process, the machine being operated at different speeds, as required, to suit the capacity of the bodies for
85 severer friction in the later stages.

The rubber rollers, with their yielding surface, perform the hand-rubbing contemplated in my caveat description. The perforated surface supplies the vapor and heat, as with the
90 steam-table, and the rolling motion and ribs upon the rotating rollers afford the mechanical rubbing for which the jigger was provided, while the combination of the movable or adjustable top rollers with the lower set secures
95 a means of producing the great pressure and friction required toward the close of the felting process.

The hollow rubber cylinders may be made in any desired way, one mode being shown in
100 Figs. 4 and 5, the shaft *s* therein being shown hollow and provided with heads *t*, upon which the rubber covering *r* is stretched, and secured by bands *b*, screwed fast over the rubber, to the heads, as at *b'*. The axle is formed with
105 side openings, *s'*, and also the india-rubber shell or cylinder, and the steam may be admitted to the hollow shaft by a swivel-coupling at one end, as at *q* in Fig. 2, or through the journal, as shown at *p* in Figs. 3 and 4.
110 For the later sizing operations the rollers may preferably be made of wood, metal, or other hard material, and supplied with steam in the same manner.

The rubber rollers may, if desired, have a
120 circulation of steam maintained in them, and the heat alone be used for such stages of the process when hot water is more effective to use than steam. At such stages of the operation the devices for lowering the rollers are
125 used, thus saving the time now spent in frequent removals of the bundles from the rolls merely to dip them in the hot water.

In Figs. 2 and 3, *h h* are the side frames of the machine, and *k* the hot-water tank forming a tie to unite them.

c c' are the lower rolls, and *d d'* the upper

rolls, the latter being mounted in a swing-frame, *f*, as usual, which can be raised and lowered at pleasure by a link, *l*, connected to a treadle-lever, *j*. The bearings of the lower set of rolls, *c c'*, are formed upon slides *e*, mounted between vertical gibs *i*, secured to the side frames, *h*, at the ends of the tank *k*. The slides *e*, with the rollers *c c'*, can be moved up and down at pleasure by rods *g* extended through stuffing-boxes *m* in the bottom of the tank to guides *n* near the bottom of the frames, and connected by links *n'* to levers *o*, operated by a rock-shaft *O* and handle *P*. The rock-shaft is mounted across the bottom of the frames *h*, near the floor, and the handle *P* extends upward from the shaft to the height of a man's shoulder, so as to give a powerful leverage to the operator; and the levers *o o* are brought into line with the links *n'* and rods *g* when the rollers are raised, thus supporting the latter firmly, as by a straightened toggle.

When it is desired to wet and warm the roll of felt lying in the rollers the rolls can easily be lowered without disturbing the rotary motion of the latter, which is secured by an intermediate gear, *u*, which is mounted upon a pair of links, *v v*, between the gears *u'* and *u''*, which are usually arranged in contact. The gear *u''* is affixed to one end of each of the felting-rollers, and the gear *u'* being mounted upon the arbor of the swing-frame *f*, the rotation imparted to the gear *u'* by a belt and pulley, as usual, is thus conveyed to the rolls *c c'*, when they are moved in any position over the water-tank.

From the above description it will be seen how I have adapted the roller-machine to all the operations required in hardening and sizing a hat, as the swing-frame *f* and the upper rollers, *d d'*, may be raised from contact with the lower rollers during the hardening stages of the felting, and pressed with great force upon the bundle in later periods of the process.

I am aware that the roller-machine described above, as in common use with solid wooden rollers, is patented, and do not therefore claim such construction, except as to the modifications I have set forth as essential to the use of my process for hardening in the presence of steam-vapor, and felting by dipping in the water, without removal from the felting-rollers.

I am aware that a single roller or drum with a yielding surface has already been used, in combination with a series of rolls or hinged slats surrounding such drum, to press the felts against the drum as it slowly revolved; but such machines have been abandoned in practice, as not capable of sufficient speed; and as the only machine capable of very rapid work is the combination of two, three, or four rollers, holding a single bundle of felts in a cavity between them, my improvements are applied solely to such machines, and consist in the ap-

plication to them of the constructive features herein claimed.

Having therefore set forth my improvements in the art or process, as well as in the mechanism, it is plain that the former can be practiced in a three-roller machine with one adjustable top roller, or in machines having only one set of rollers for use in the hardening operation.

I therefore claim my invention as follows:

1. In a hat-felting machine having a pair of rollers adapted to felt a bundle of hats by rolling it in the cavity between them, the combination of a hollow roller with a hollow journal and a supply-pipe for feeding steam thereto when in motion, substantially as and for the purpose set forth.

2. In a hat-felting machine having a pair of rollers adapted to felt a bundle of hats by rolling it in the cavity between them, the combination, with the hollow roller supplied with steam internally, of the perforations or apertures upon its surface for discharging steam against the bundle of felts while in motion, substantially as herein set forth.

3. In a hat-felting machine, a pair of india-rubber or rubber-covered rollers arranged side by side, and operated as herein shown and described, to felt a bundle of hats by rolling it in the cavity between them.

4. In a hat-felting machine having a pair of rollers arranged and operated as herein described, the combination of a hollow shaft, a perforated rubber cylindrical covering or shell, and means for supplying steam to the interior of the shaft, and thus ejecting it upon the felt in contact with the yielding surface of the cylinder, substantially as herein set forth.

5. In combination with the perforated hollow rubber roller operating in such a machine in the manner described, the india-rubber ribs formed upon the surface of the rubber shell, substantially as herein set forth.

6. In a machine constructed with upper and lower sets of felting-rollers, arranged and operating as herein described, to felt a bundle of hats in the cavity between them, the combination of yielding rubber coverings upon all the rollers with a steam-connection to one or more of them, and perforations upon the surface of such roller or rollers to diffuse the steam into contact with the bundle while felting, in the manner and for the purpose set forth.

7. The combination of the perforated table, having steam supplied to its interior for the purpose set forth, with the box-cover for inclosing the felt in the steam when desired.

In testimony that I claim the foregoing I have hereto set my hand this 3d day of February, A. D. 1881.

JOHN WHARTON.

Witnesses:

THOS. S. CRANE,
CHAS. C. HERRICK.