

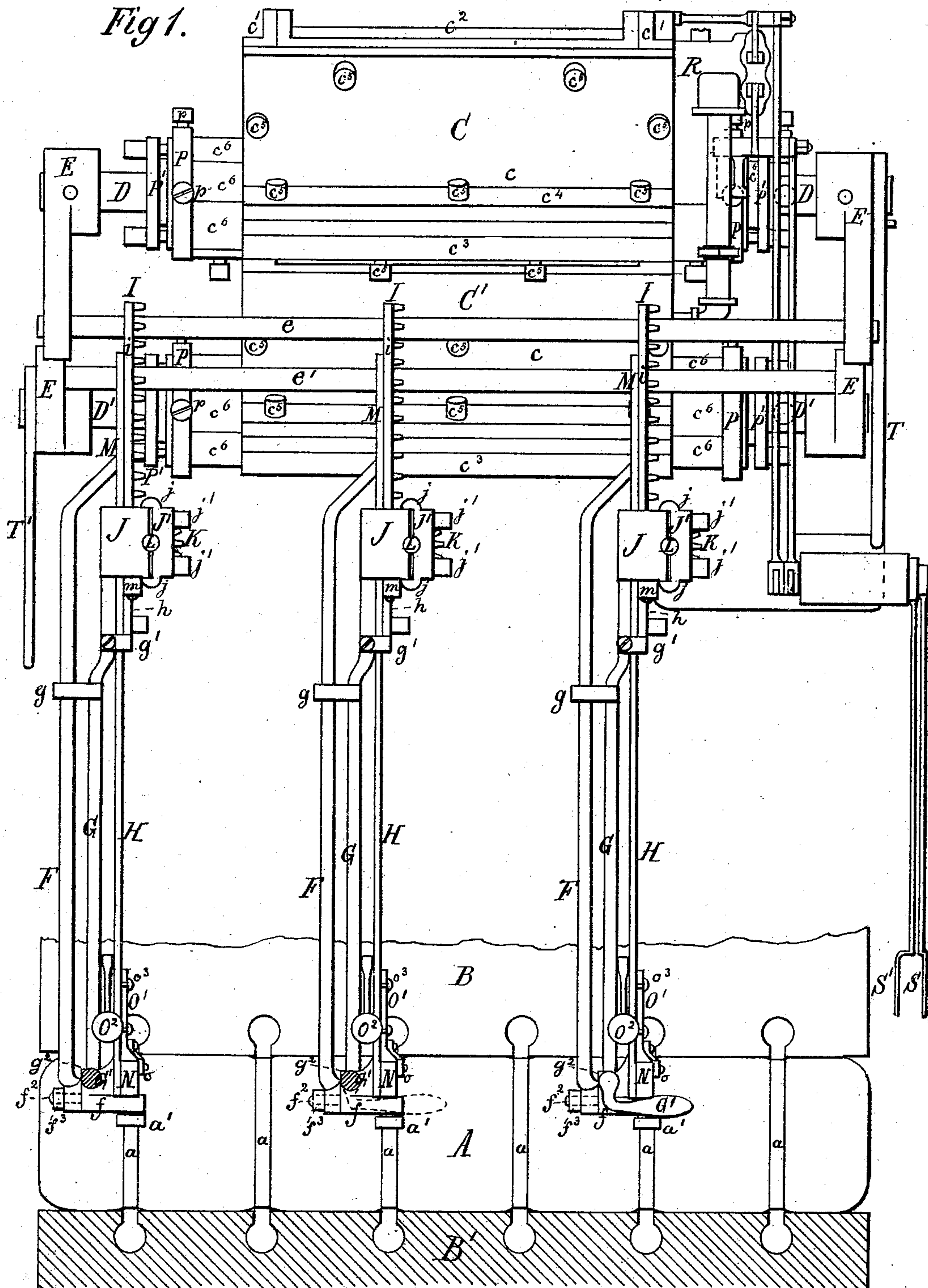
S. H. GILMAN.

Machine for Tightening and Tying Bale-Bands.

No. 215,451.

Patented May 20, 1879.

Fig 1.



Witnesses:  
J. P. Th. Lang.  
G. H. Theodore Lang.

Inventor:  
Samuel H. Gilman  
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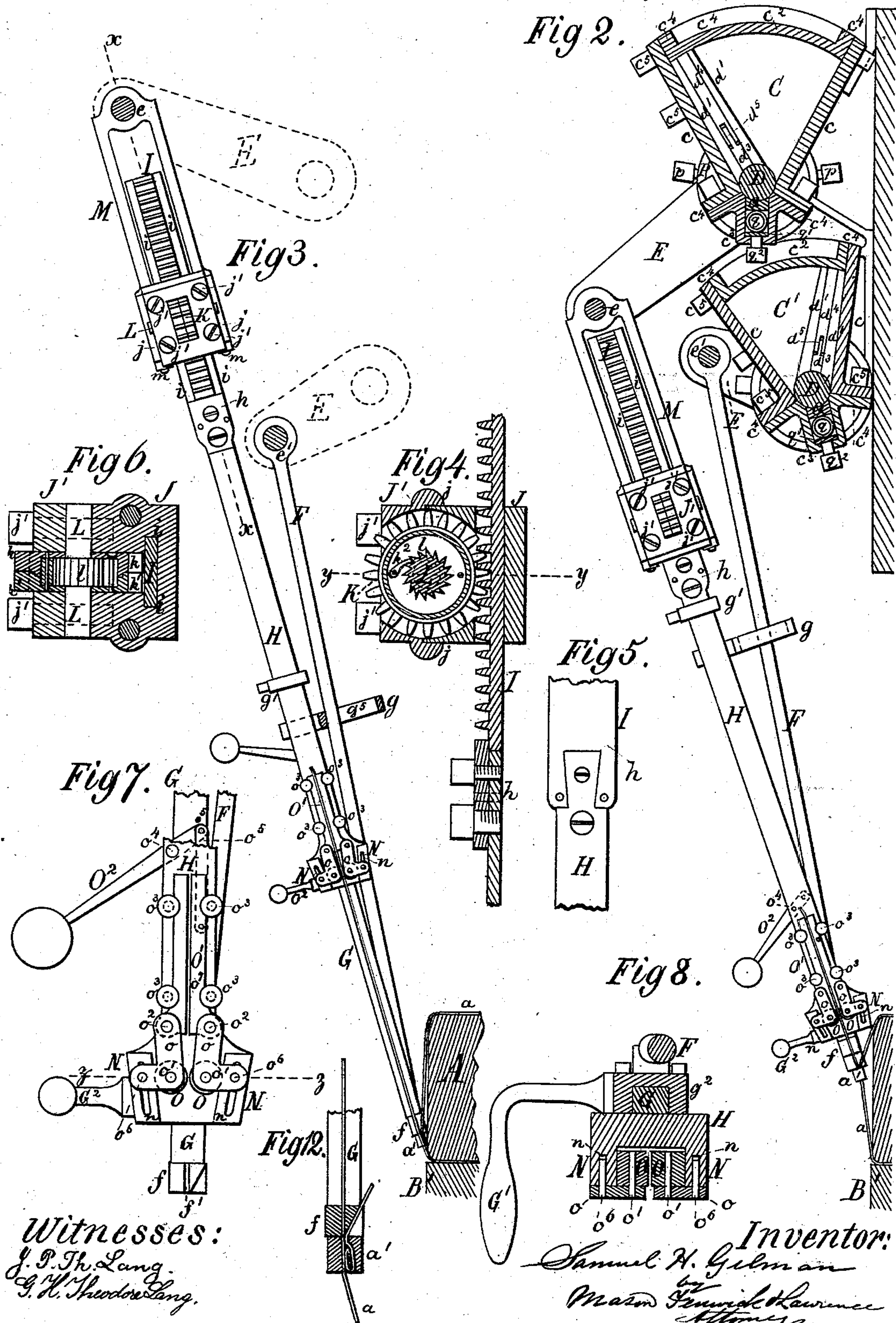


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Fig 9.

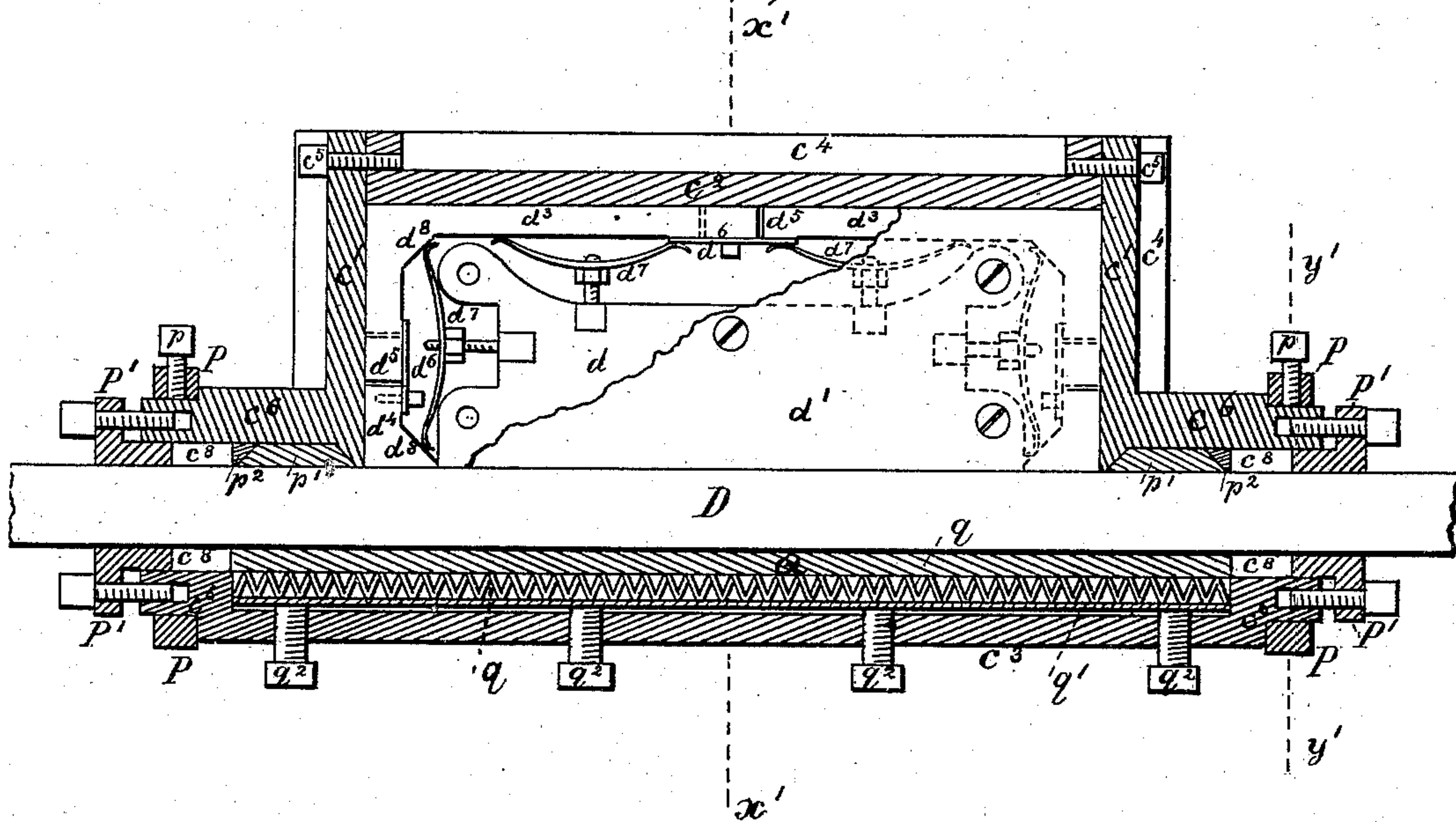


Fig 10.

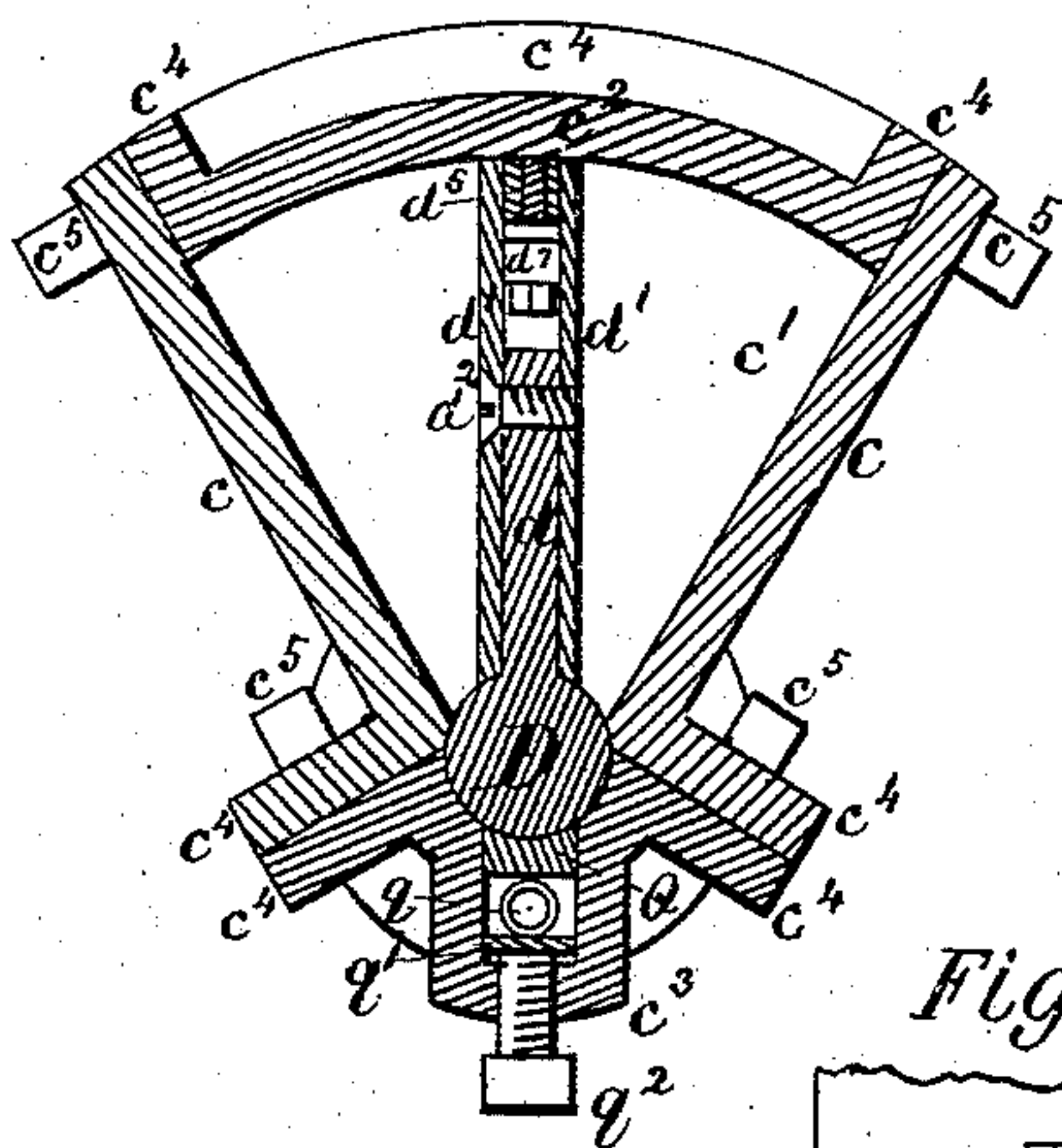


Fig 11.

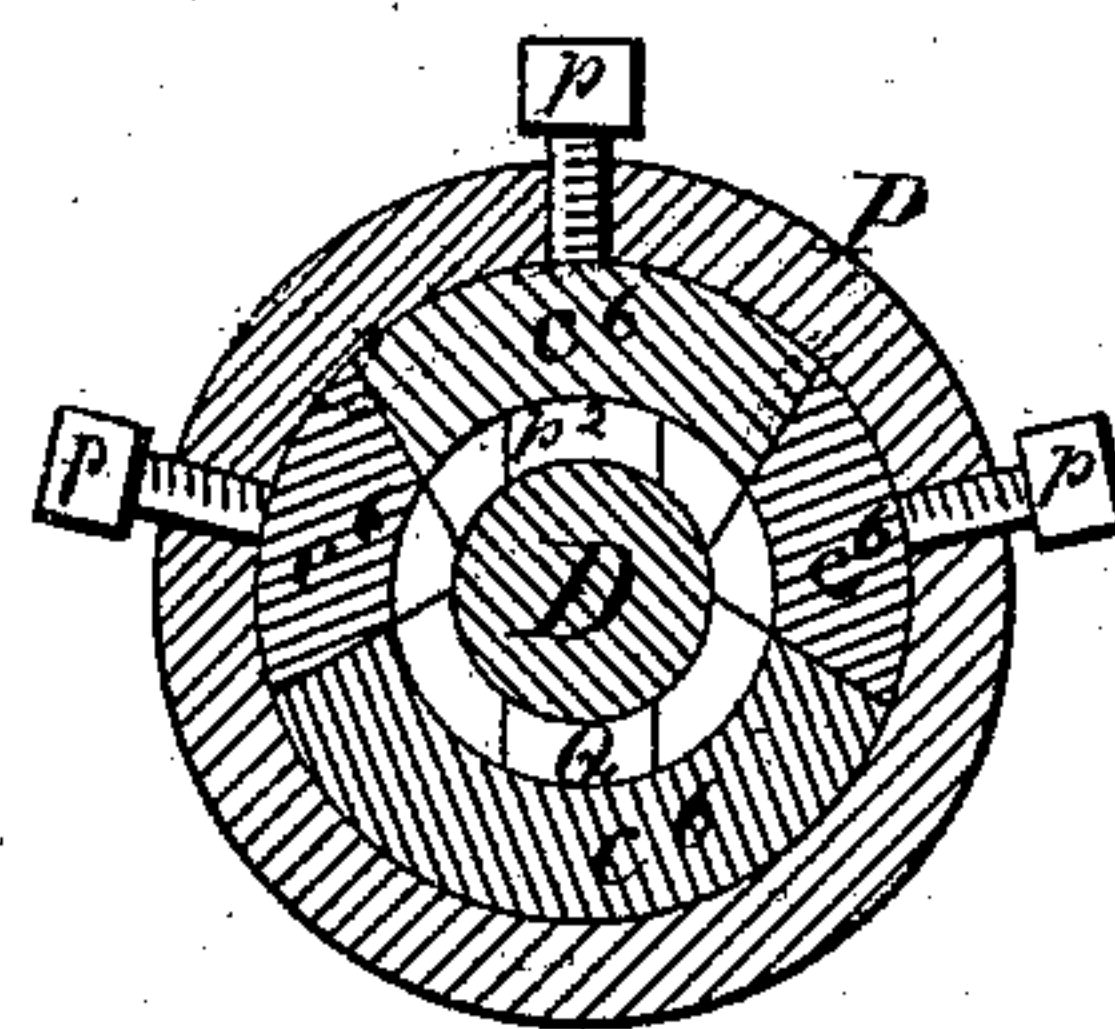
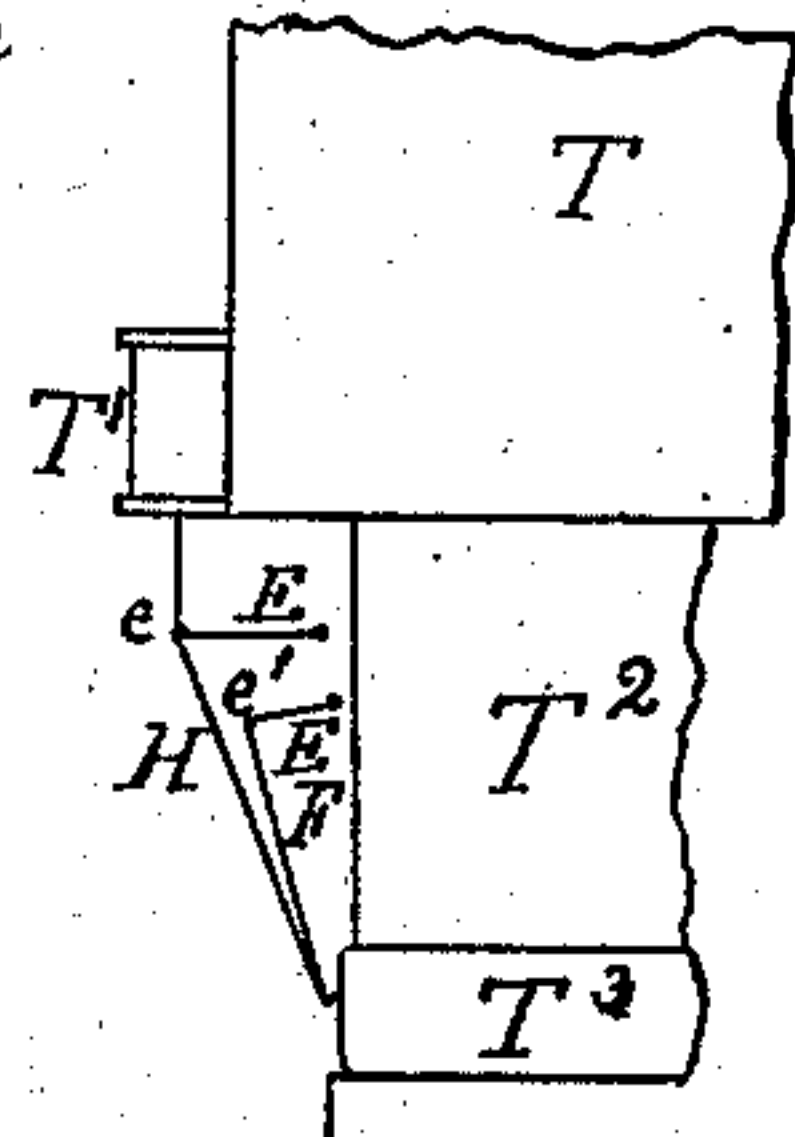


Fig 13.



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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN MACHINES FOR TIGHTENING AND TYING BALE-BANDS.

Specification forming part of Letters Patent No. **215,451**, dated May 20, 1879; application filed March 27, 1879.

*To all whom it may concern:*

Be it known that I, SAMUEL H. GILMAN, of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Improvement in Machines for Tightening and Tying Bale-Bands, which improvement is fully described in the following specification and accompanying drawings, in which latter—

Figure 1 is a front view and partial section of one of my improved band tightening and tying machines as it appears before the operation of tightening, the main part of the upper platen of a press being shown in elevation, and a part of the lower platen being shown in section. Fig. 2 is a side elevation of the same, wherein the upper parts are shown in section in order to expose the interior parts to view. Fig. 3 is a detail view of the pulling and pushing rods of the same as they appear at the end of their operation, as will be hereinafter explained. Fig. 4 is a section, in the line  $xx$  of Fig. 3, through a braking device attached to the pulling-rod. Fig. 5 is a detail back view of the pulling-rod and a thereto-attached rack, showing the mode of joining the said two parts. Fig. 6 is a transverse section in the line  $yy$  of Fig. 4. Fig. 7 is an enlarged view of the lower clamping device of the pulling-rod and its connections. Fig. 8 is a transverse section in the line  $zz$  of Fig. 7. Fig. 9 is a central longitudinal section of one of the steam-motors used for operating my band-tighteners, showing an oscillating piston with one of its followers partly broken away in order to expose the packing to view. Fig. 10 is a transverse section of the same in the line  $x'x'$  of Fig. 9. Fig. 11 is a transverse section in the line  $y'y'$  of Fig. 9; and Fig. 12 is an enlarged detail view of the pusher-foot and the band-tie, and showing the position of the band ends and the tie during the operation of my machine.

The main object of my invention is to furnish a machine for tightening and tying bale-bands adapted to be worked by steam-power, and which, when attached to a cotton-compressor, will draw the iron bands to any desired tension on the bale, and firmly unite their two ends more effectually and with far greater rapidity than can be done by hand-power.

Among the most essential results to be produced by a machine of this character are,

first, that an equalizer shall be made to automatically limit and hold on to any determined desirable strain upon the bands to which the equalizer is set, and so strain all the bands alike or with a uniform strain; and, second, that the rollers which hold and also release the band shall be applied between inclined planes of a proper degree of inclination—say, seven degrees and thirty minutes, or between six degrees and thirty minutes and eight degrees and thirty minutes—in order that the band may be released without any effort or attention of the operator; and these two results, among others, are most effectually accomplished by my machine, while at the same time the bands are tightened and tied around the bale.

In the accompanying drawings, A represents a cotton-bale with bands  $a$  and ties  $a'$ , which bale is compressed between two platens, B B', of a cotton-compressor. C C' are two steam-engines, of similar construction, the one, C, serving to draw the bands tight by their lower ends, and the other, C', serving to tighten the bands by forcing down their upper ends. D D' are the two respective main shafts of the steam-engines, provided with rocking arms E at their ends, which arms are connected by horizontal rods  $e e'$ .

To the rod  $e$  the pulling-bars of the bands  $a$  are loosely fitted, and to the rod  $e'$  the pushing-rods of the bands are fitted in the same way.

Each band is operated upon by a pushing-rod and a pulling-bar; and as the construction of each pair of such rod and bar is the same, (one rod and one bar constituting the pair,) I shall describe but one pair of them in their connections.

F is the pushing-rod. It is loosely fitted upon the rod  $e'$ , and has a foot,  $f$ , set at a right angle with the rod, and parallel to the front of the bale. This foot  $f$  is provided with a vertical slot,  $f^1$ , parallel with the bale, and open at the top, front, and bottom of the foot, in order that the band shall readily pass into and out of the slot, and it is attached to the lower end of the pushing-rod F by means of an ordinary round shank,  $f^2$ , and a nut,  $f^3$ , in such manner that the rod F is permitted to turn on the shank  $f^2$  of the foot.

The foot  $f$  is tapered in form of the letter V



on its rear side, so as to allow the downward-extending end of the bale-band to pass outside of the slot  $f^1$  into the opening of the tie  $a'$ , while the upwardly-ascending end of the said band is passed through the tie  $a'$  and the slot  $f^1$ , the office of the V formation being to separate the two ends of the band above the tie  $a'$ , in order to get a bearing nearly central with the tie and between the bands, and still permit said ends to unite inside the tie below the foot, as shown in Fig. 12.

The foot  $f$  is rigidly attached to a guide-rod,  $G$ , the upper end of which is provided with a slotted guide-head,  $g$ , through an oblong slot,  $g^5$ , of which the rod  $F$  passes, and with a clasp,  $g^1$ , which is fitted around and slides upon the pulling-rod  $H$ . The upper part of the pulling-rod is, by means of an ordinary coupling device, (shown at  $h$ ,) united to a rack,  $I$ , with lateral flanges  $i$ , which are fitted into a housing box or case,  $J J'$ , so as to slide up and down therein.

The teeth of the rack  $I$  gear with the teeth of a pinion,  $K$ , which is partly inclosed by the housing-box  $J J'$ , and is provided with a loose shaft,  $L$ , having its bearings in the said case  $J J'$ . The part  $J'$  of the case is provided with guide-flanges  $j$ , which bear upon and overlap the sides of the part  $J$  of the case, and is united with the same by screw-bolts  $j'$ , which serve to adjust the friction of the shaft  $L$  in its bearings.

A double-armed hanger,  $M$ , loosely fitted upon the shaft  $e$ , and fastened, in the usual manner, by means of nuts  $m$ , to the case  $J J'$ , connects the pulling-rod  $H$  with the upper engine,  $C$ .

The pinion  $K$  is hollow, and consists of two similar parts,  $k k^1$ , suitably rabbeted together, and provided with one or more inner pawls,  $k^2$ , which take into a ratchet-wheel fastened to or formed upon the shaft  $L$ , so that a downward motion of the pinion and housing on the rack will rotate the pinion around the shaft  $L$ , and cause the pawl or pawls  $k^2$  to slide over the ratchet-wheel  $l$ , while an upward motion of the housing will cause the revolving pinion to engage the pawl or pawls  $k^1$  with the ratchet  $l$ , and rotate it also.

The pressure of the parts  $J J'$  upon the bearings of the shaft  $L$ , caused by tightening the screws  $j'$ , prevents the shaft from turning freely, and the resistance of the shaft to free rotation varies with the degree of clamping force exerted upon the shaft by means of the parts  $J J'$  and screws  $j'$ . This clamping force is so adjusted, prior to putting the machine in operation, that the strain necessary to move the pinion and shaft by the rack shall equal either the tensile power of the band  $a$  or the maximum of power it is desirable to exert upon the band for the purpose of tightening the band around the bale, and in this manner an equal amount of power may be applied to each of the bands, and all be uniformly tightened.

The lower end of the pulling-rod  $H$  is pro-

vided with two equally-inclined downwardly-converging flanges,  $N$ , the inner faces of which serve as ways and bearings for two clamping-rollers,  $O$ . These rollers are of such diameter and relative location that they nearly meet near the lower ends of the flanges  $N$ , and thus clamp the upwardly-projecting portion of the bale-band when placed between them, and they are pivoted at  $o^1$  to angular links  $o$ , which are pivoted at  $o^2$  to a slide,  $O^1$ , and are thus kept in parallel position. The links  $o$  are provided with guide-pins  $o^6$ , which slide in converging slots  $n$  in the flanges  $N$ , and thus serve to move the rollers  $O$  apart at their highest elevation, and thus relieve them from the band.

The slide  $O^1$  is properly held and guided between large-headed guide-studs  $o^3$ . A central groove,  $o^7$ , in the face of the slide serves to receive and steady the free end of the band. A weighted counterbalance-lever,  $O^2$ , pivoted at  $o^4$  to the bar  $H$ , and connected, by a link,  $o^5$ , with the slide  $O^1$ , slightly overbalances the weight of the slide and rollers, and thus keeps the slide and rollers up when the rollers are not gripping the band, and as it offers but slight resistance to the descent of the slide, it rises when the rollers  $O$  are caused to gripe the band.

A guide-clasp,  $g^2$ , for the guide-rod  $G$  is attached to the lower part of the rod  $H$ , and serves, in conjunction with the guide-clasp  $g^1$ , to keep the guide-rod in line with the rod  $H$ .

A handle,  $G'$ , is attached to the clasp  $g^2$ , and serves to facilitate the manipulation of the pulling and pushing rods.

The steam-engines  $C C'$  are made in the shape of cylindrical sectors, with oscillating shafts and pistons. The stationary shells of said engines are suitably fastened to the opposite sides of a cotton-press in conjunction with which they are intended to work. The said shells are composed of two plates,  $c$ , two end plates,  $c^1$ , a periphery-plate,  $c^2$ , and a shaft-packing case,  $c^3$ , which are fastened together by flanges  $c^4$  and bolts  $c^5$ . The plates  $c c^1 c^2$  and case  $c^3$  are provided with longitudinal extensions  $c^6$ , in the form of sectors arranged around the shafts  $D D'$ , whereby hubs are formed, which are held together by collars  $P$ , having set-screws  $p$ , stuffing-boxes  $c^8$ , and glands  $P'$ .

The packing in the case  $c^3$  consists of a longitudinal bearing,  $Q$ , snugly fitted on the main shaft of the engine, a spring,  $q$ , below the packing-bearing  $Q$ , a pressure-plate,  $q^1$ , and a suitable number of adjusting set-screws,  $q^2$ , in the bottom of case  $c^3$ .

The shafts  $D D'$  are provided with flat pistons  $d$ , as shown in Figs. 9 and 10, which pistons have a follower,  $d^1$ , at each side, fastened together by screw-bolts  $d^2$ . Between these followers the packings  $d^3 d^4$  are confined, which packings are snugly tenoned into each other at  $d^5$ , each tenon being covered by an inner plate,  $d^6$ , to make it steam-tight. These packings are provided with springs  $d^7$ , two of which rest against inclined end bearings,  $d^8$ ,



formed in the corners of the said packings, in order to keep the packing properly in position. Opposite the packing Q, at the two ends of the engine, two metal packings,  $p^1$ , with inclined end faces, are inserted into the upper extensions  $c^6$ , and two triangular wedges,  $p^2$ , which form part of the bottoms of the stuffing-boxes, serve to force said packings upon the shaft.

The two engines C C' are provided with ordinary steam-chests R and slide-valves, which latter are operated by means of hand-levers S S', and serve to supply steam to and exhaust it from the steam-engines in the well-known ordinary manner.

After a bale, A, has been compressed, the bands  $a$ , provided with ties  $a'$ , are passed around the bale, so that the ties are suspended from the upper side of the bale at an altitude corresponding with that of the slotted feet  $f$  of the tightening apparatus. The lower ends of the bands  $a$  are now drawn through the ties  $a'$  in front of the upper ends, and the rods F and H are moved toward them, so that the feet  $f$  are above the ties. The lower ends of the bands projecting above the ties  $a'$  are now passed up through the slots  $f^1$ , and on up between the rollers O and in the groove  $o^7$  of the slide, when the bars H are moved upward and the rollers O downward, the latter being caused by their friction upon the bands to move toward the converging ends of the flanges N and clamp the bands between them, whereupon steam is admitted to the engines C C' by means of the valve-levers S S', and the bands drawn tight to the requisite degree, for which hand-power would not be sufficient. The rods F during this operation are steadily moved down, pushing the ties  $a'$  before them, while at the same time the rods H are drawn up, pulling the free ends of the bands with them.

When the strain upon a band has reached its limit—say twelve hundred pounds—according to the gaged pressure of the screws  $j'$  upon the shaft L, the resistance of the shaft L against rotation between the housing J J' is overcome, whereupon the pinion K revolves with its shaft L, and with its hanger and housing travels upwardly on the rack I of the bar H, while at the same time the bar H becomes stationary, and by the interlock of the teeth of the pinion and the rack is held under the same strain it sustained when the pinion K commenced to rotate with its shaft. After the strain is thus completed and the engines reversed the band becomes slackened, the pressure on the rolls O is relieved, and they rise and open by the weight of the counter-balance O<sup>2</sup>. The freed end of the band is then cut off above the foot  $f$ , and the bale relieved and removed from the press, ready for transportation.

The tie  $a'$  (shown in section in Fig. 12) is only one of the ties known and adaptable for use in my bale-tightening machine, and as the operation of the same is well known a description thereof is unnecessary.

Of the six bands usually provided for one

bale, I tie and fasten three of them on one side and three on the opposite side of the bale, and thus, as each tightening and tying apparatus is attended by one man, six men can simultaneously work on one bale without being in each other's way. In this manner cotton-bales can be compressed, provided with bands, and delivered for transportation in a few seconds—a result not heretofore attained.

The self-acting equalizer for insuring a uniform given strain upon all the bands of a bale (shown in section in Fig. 4) renders unnecessary all regulation as to tension by hand of the operator, and is far quicker and more reliable; and as the tightening apparatus is suspended from above, and made movable laterally and out of the way of injury, the bales can be readily discharged from the compress.

I do not confine myself to operating the pulling and pushing devices by the sector-engines above described, as other engines may be connected to rocking arms of the rods  $e e'$ , for the purpose of operating said pulling and pushing devices, one pulling-engine being at one end and one pushing-engine at the other end of the compressor on both sides of the bale. Fig. 13 illustrates how this may be done on one side of the bale, the main steam-cylinder being shown at T, and one of the auxiliary upright steam-cylinders at T<sup>1</sup>. T<sup>2</sup> shows the press-beam; T<sup>3</sup>, the bale; H, the pulling-rod; F, the pushing-rod;  $e e'$ , the horizontal rods for connecting in pairs the rocking arms E E.

By hanging the pulling and pushing bars loosely on the horizontal rods  $e e'$ , these bars can be moved laterally, so as to tie a band in any one of the grooves of the platen.

What I claim as my invention is—

1. The band-pulling and tie-pushing rods H F, connected to the piston-shafts D D' of steam-engines by rods  $e e'$ , connected to arms E E, substantially as and for the purpose described.

2. The combination of two steam-engines and two oppositely-moving rods, which are guided by one another and are applied to swing and slide on rods  $e e'$ , and serve for respectively pulling upon the bale-band and pushing upon the bale-tie, said rods F and H being moved simultaneously by engines which are independent of one another, substantially as and for the purpose set forth.

3. The band-puller proper, consisting of a band-pulling rod or bar and a tie-pushing rod or bar, each guided by the other and moving in the same parallel planes, and said rods or bars being respectively provided with a vibrating rod, as at  $e e'$ , substantially as and for the purpose set forth.

4. The band-gripping device attached to the puller-rod, consisting of two rollers, which move up and down on inclined planes, and also laterally from or toward each other, substantially as and for the purpose set forth.

5. The combination of the counter-balance O<sup>2</sup> and its connections, the gripping-rollers O, and the pulling bar or rod H, substantially as and for the purpose set forth.



6. The combination of an equalizer, which is made unyielding by frictional contact up to a certain strain and then yields, and a band-pulling apparatus, whereby the strain on the band of a bale is equalized and breakage of the band by undue strain is avoided, substantially as and for the purpose described.

7. The pushing-rod F, provided with a foot, *f*, at right angles to it and parallel with the side of the bale being compressed, and having a vertical slot, also parallel to the side of the said bale, and a bevel rear side, which allows the two ends of the bale-band to be separated above the tie, and then united in or below the tie, substantially as set forth.

8. The pulling-bar H, provided at its lower end with two projecting sides, N N, inclined inward at the bottom, whereby the rollers or plates resting against their inner sides and sliding down will be pressed together and caused to gripe the bale-band, substantially as described.

9. The equalizer consisting of a shaft, L, pinion K, ratchet and pawl *k*<sup>2</sup> *l*, housing J J', and toothed rack I, substantially as and for the purpose described.

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