

No. 672,636.

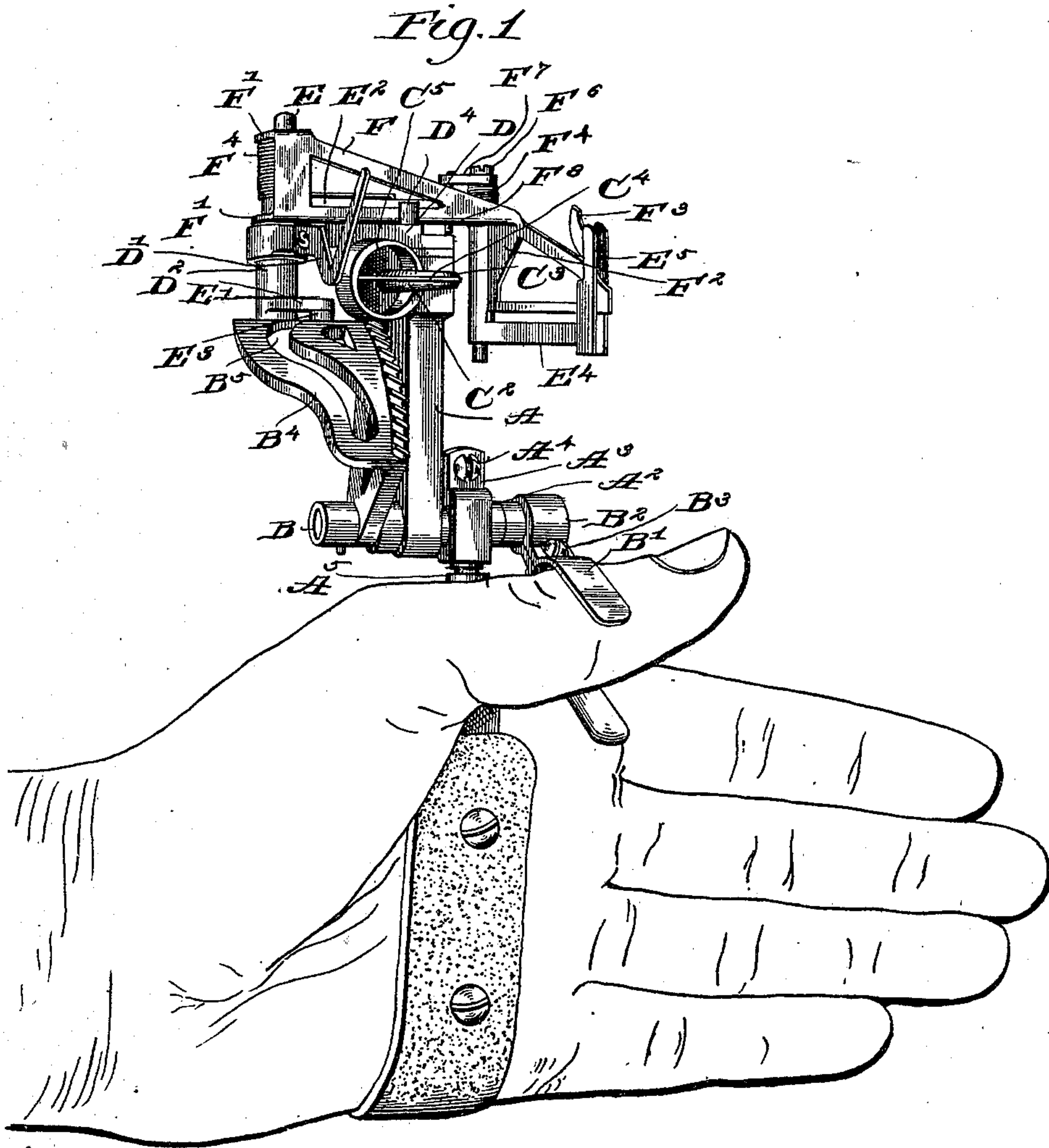
Patented Apr. 23, 1901.

H. D. COLMAN.
KNOT TYING IMPLEMENT.

(Application filed Feb. 20, 1901.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses

D. A. Paubenschmitt.
J. H. Glendening.

Inventor

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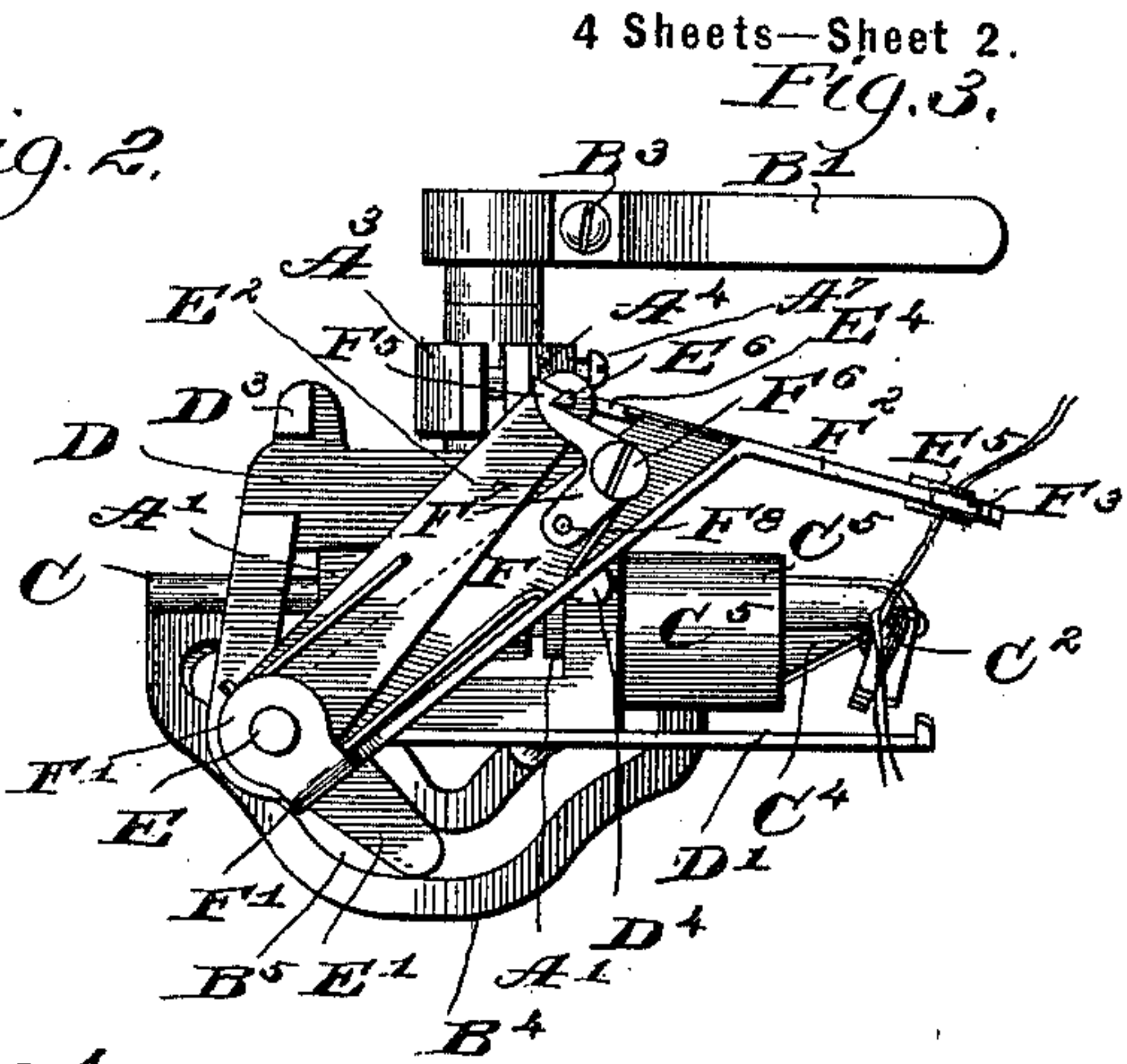
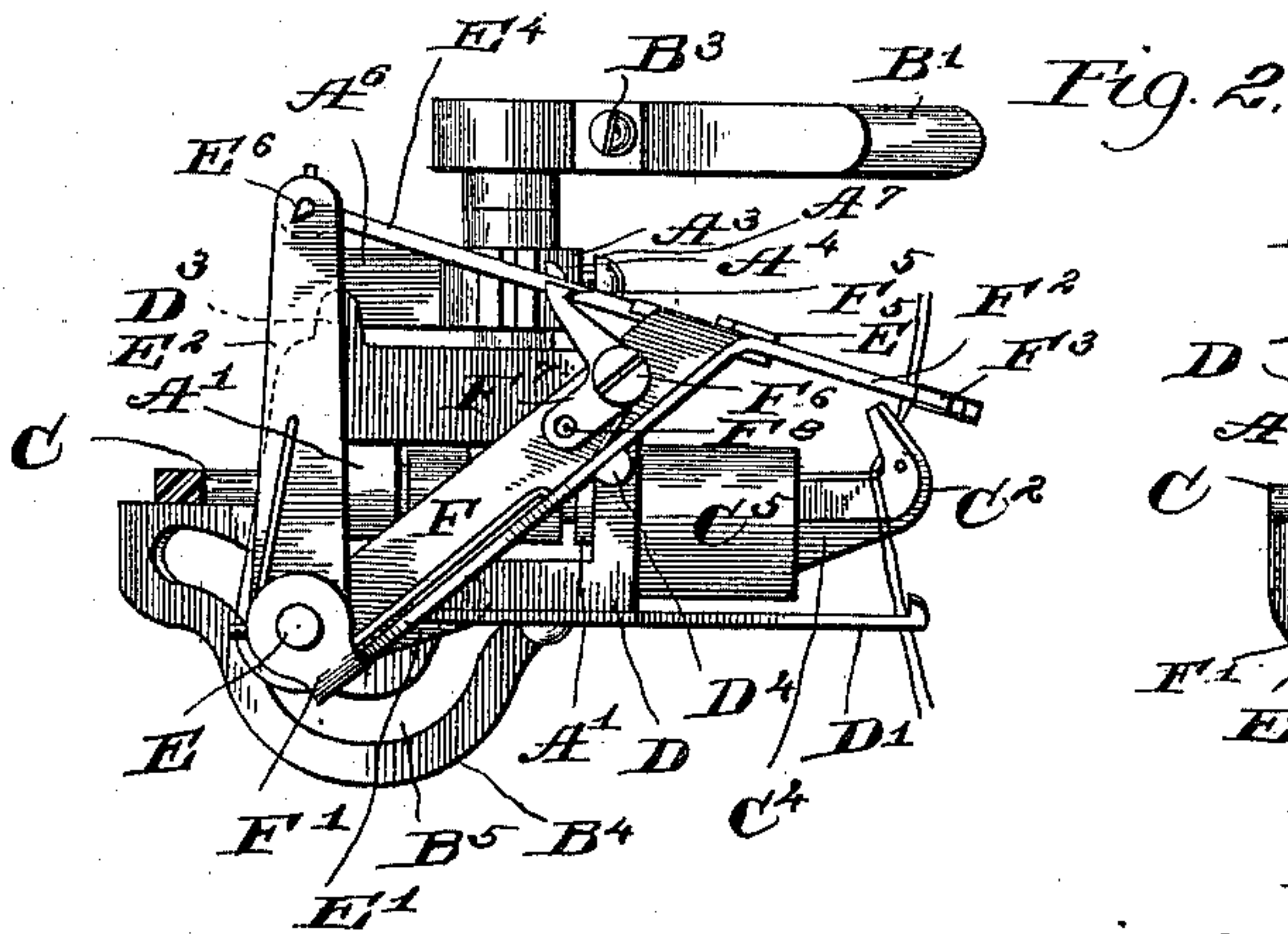
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4 Sheets—Sheet 3.

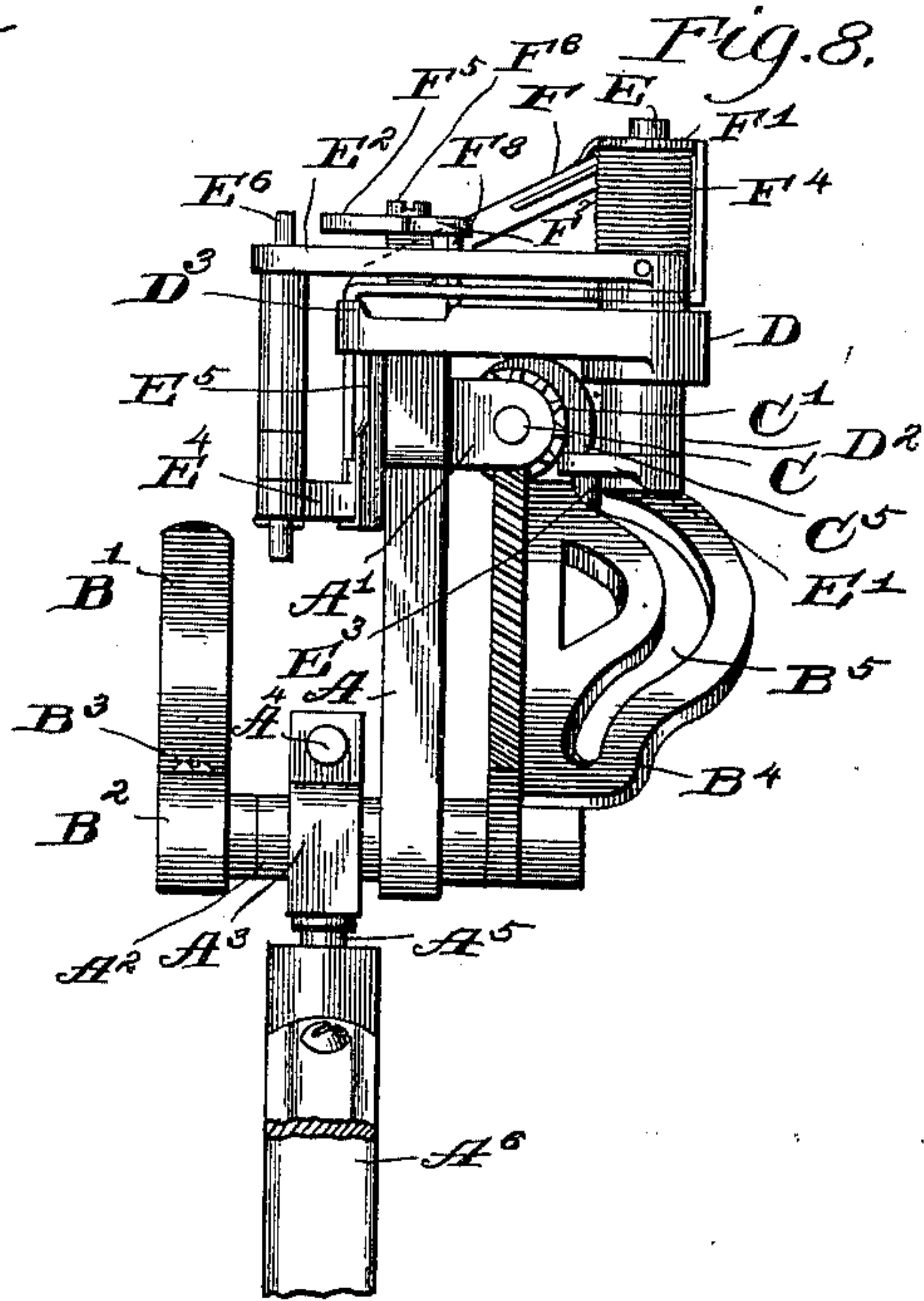
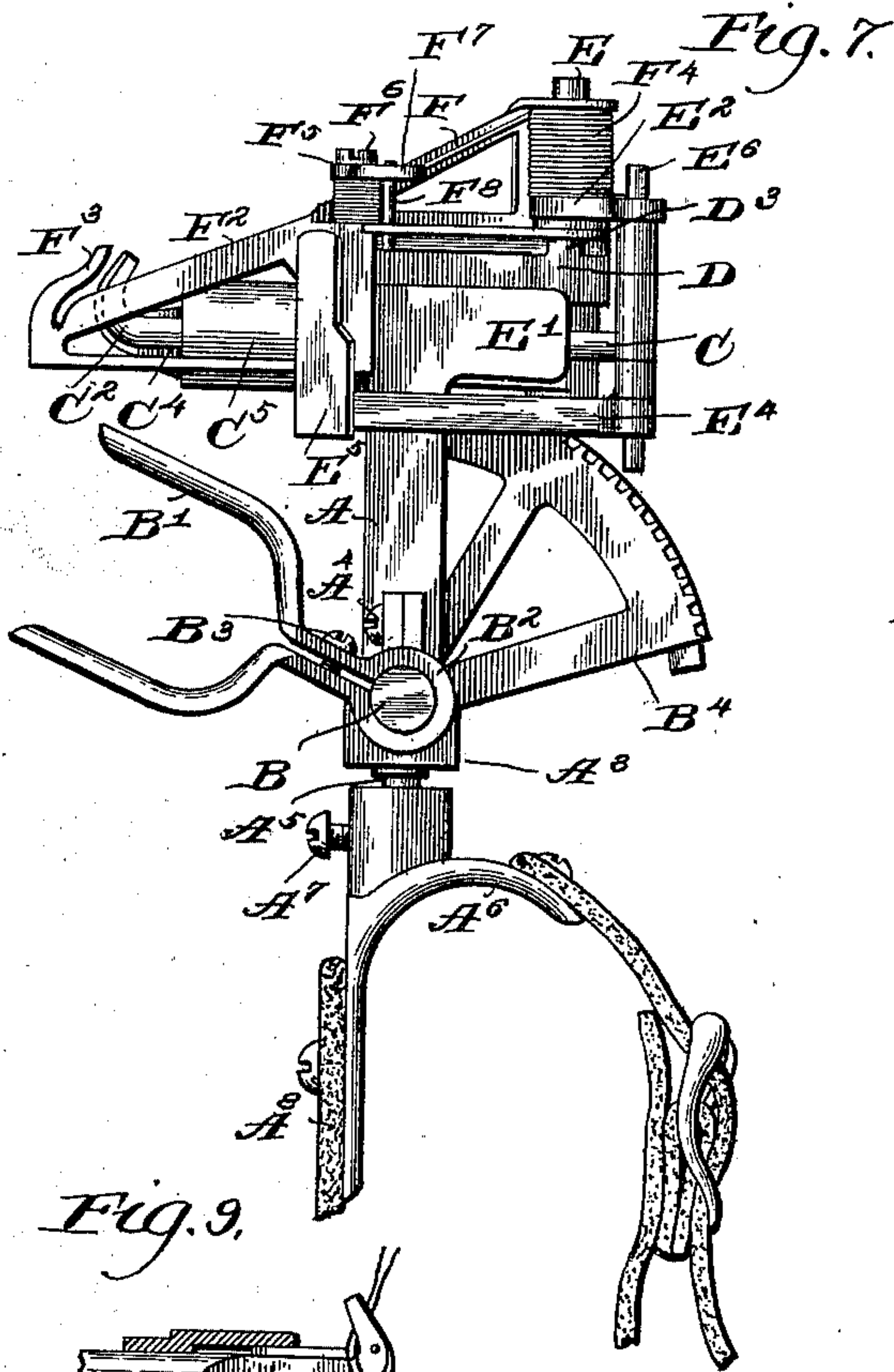


Fig. 9.

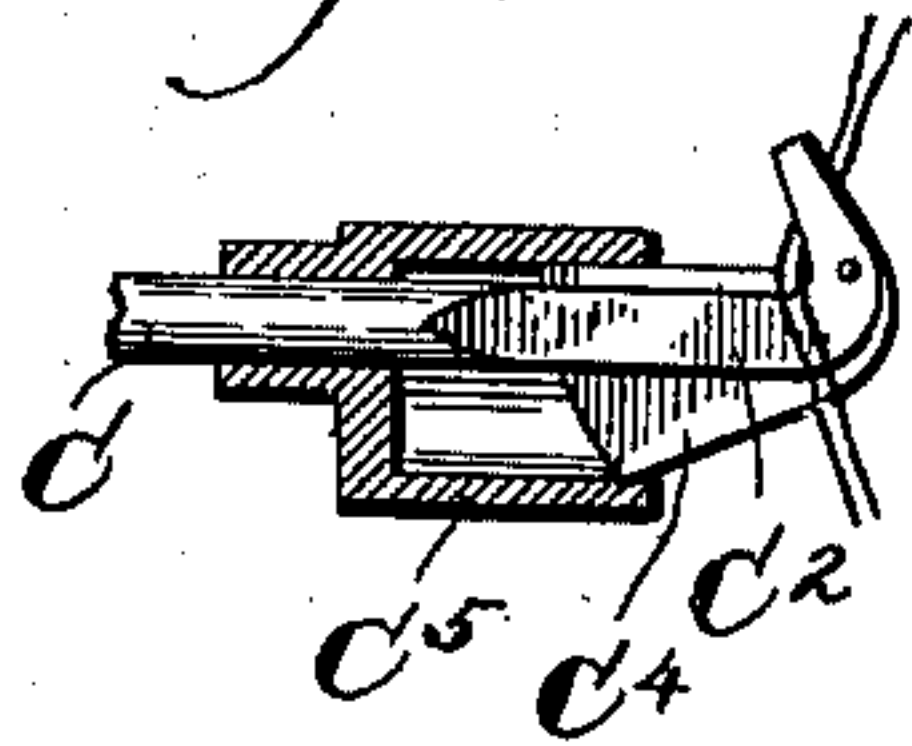


Fig. 12.

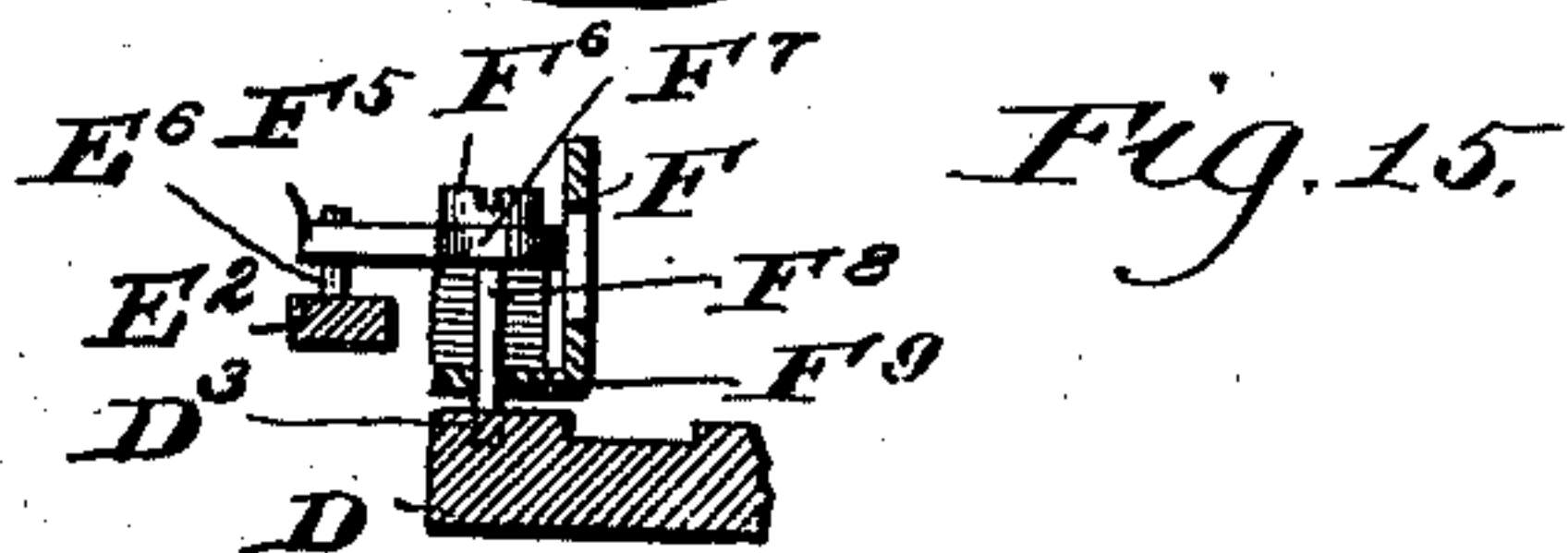
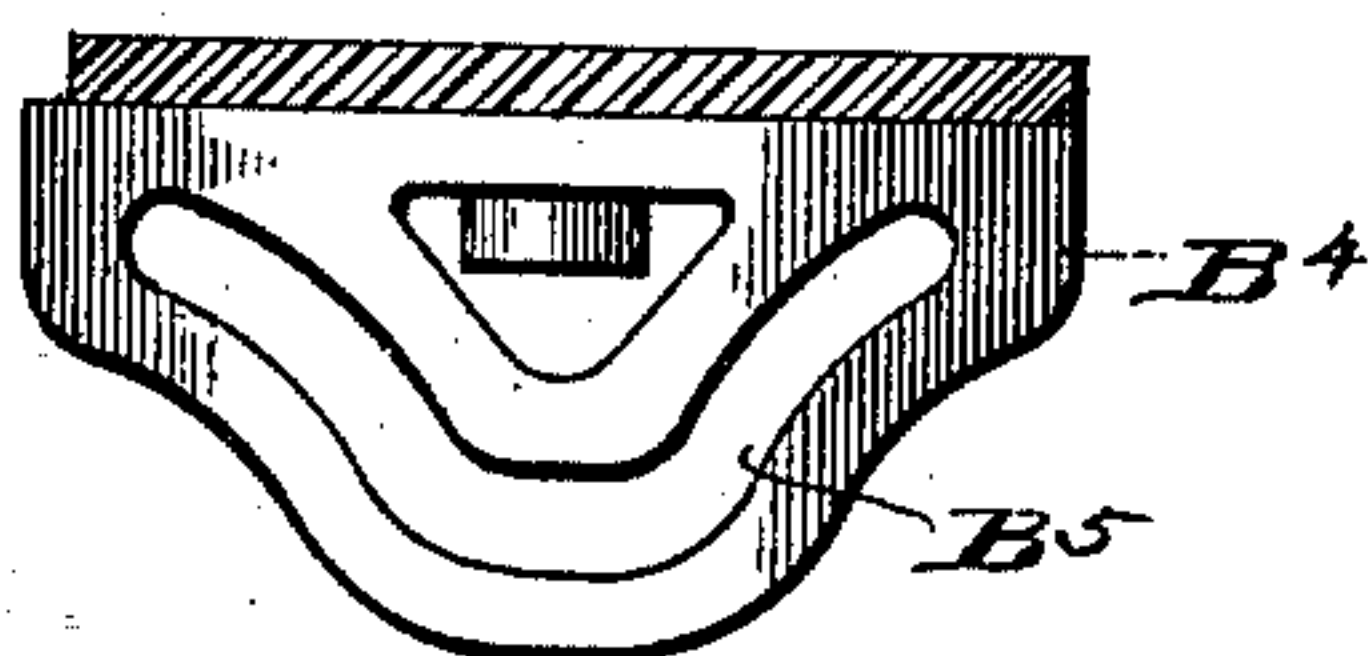


Fig. 15.

Fig. 10.

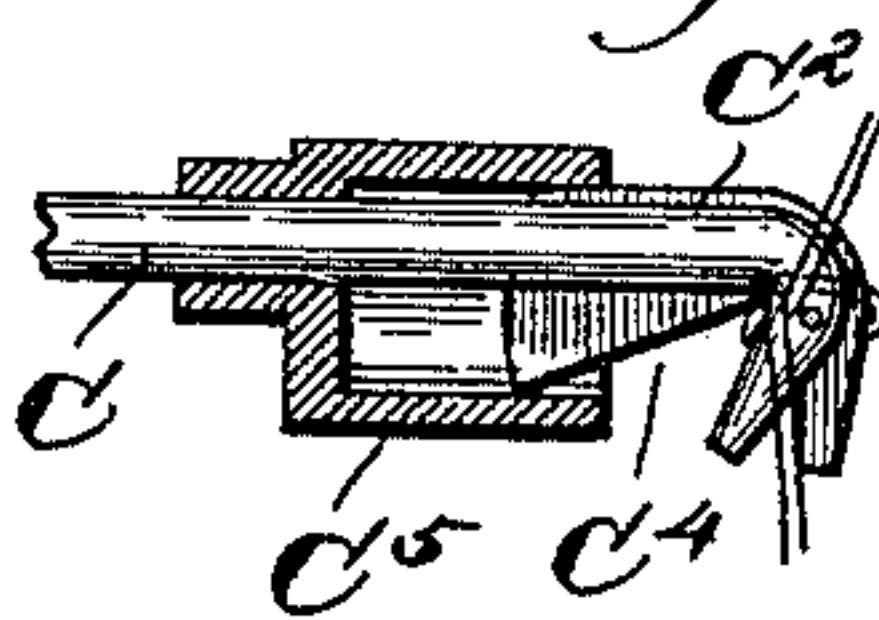
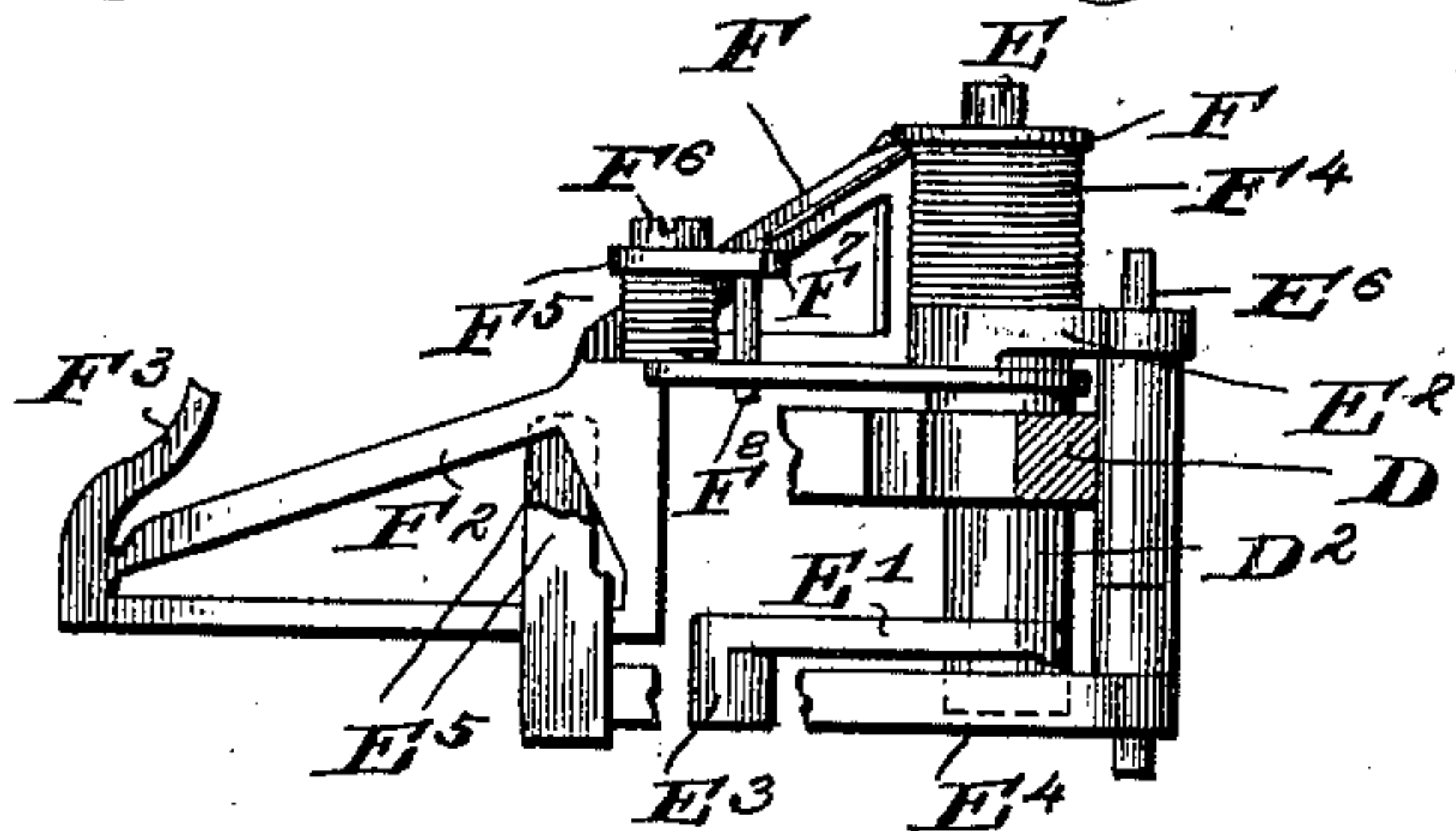


Fig. 11.



Fig. 13.



Witnesses

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4 Sheets—Sheet 4.

Fig. 16.

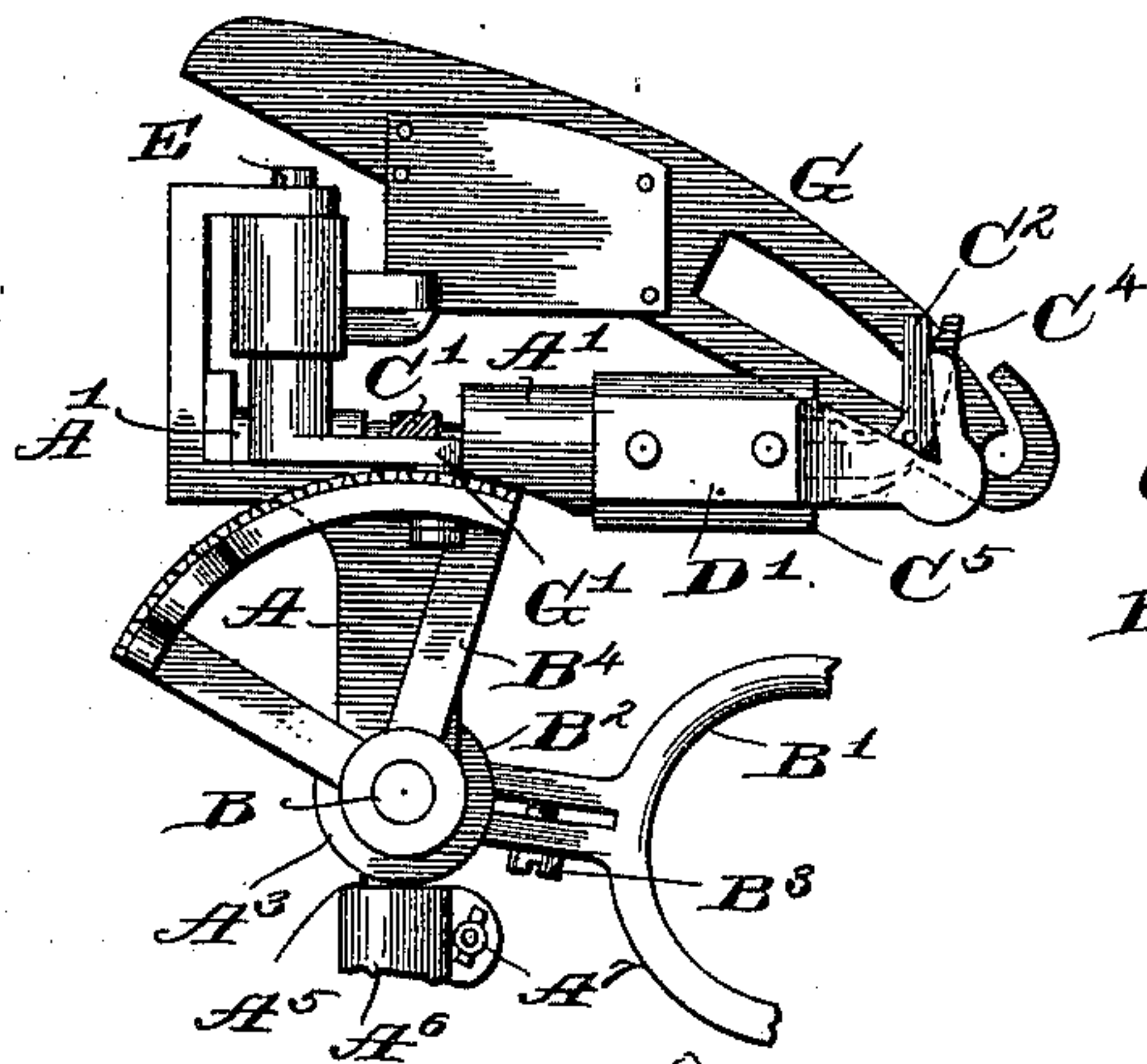


Fig. 17.

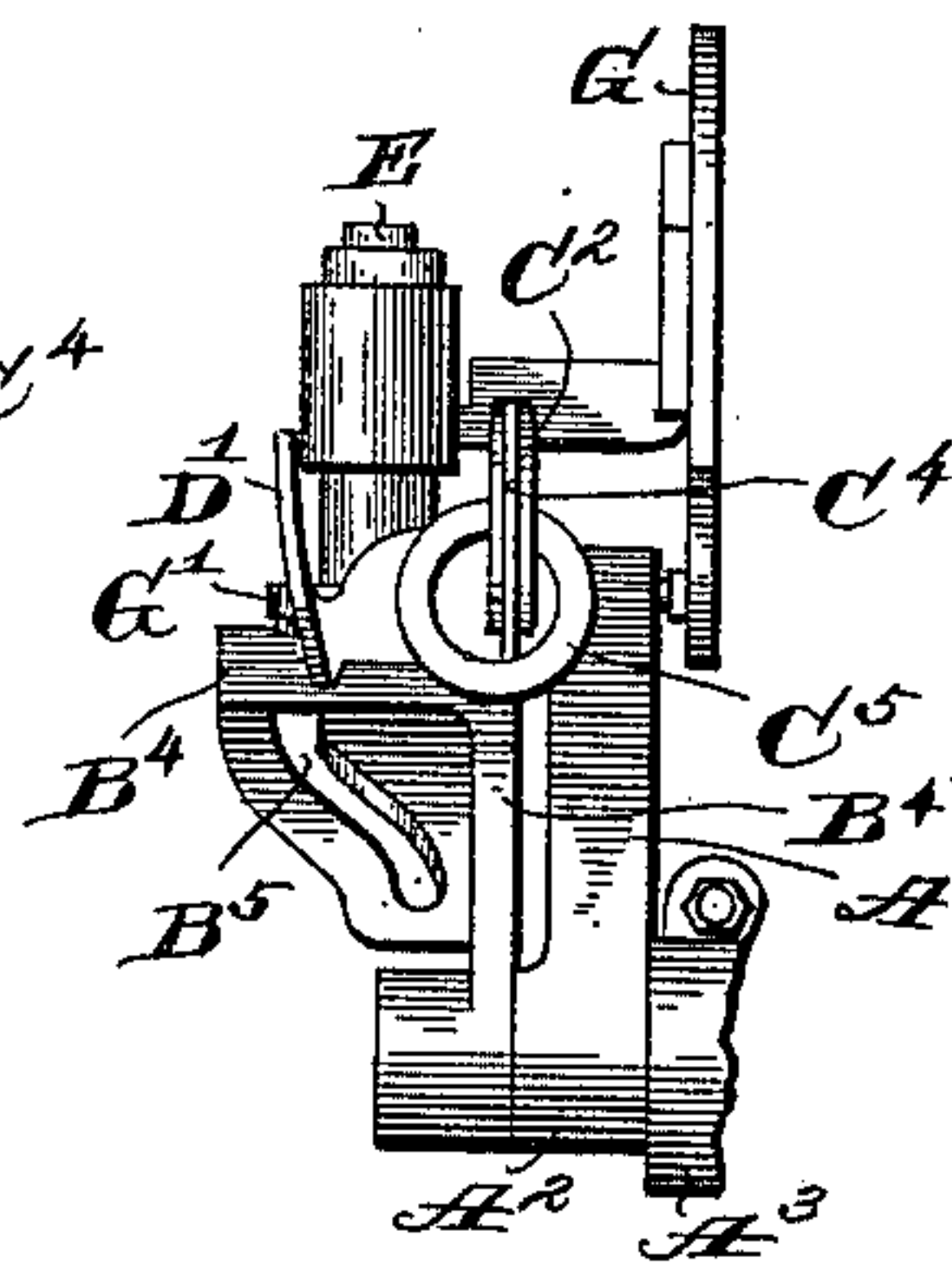
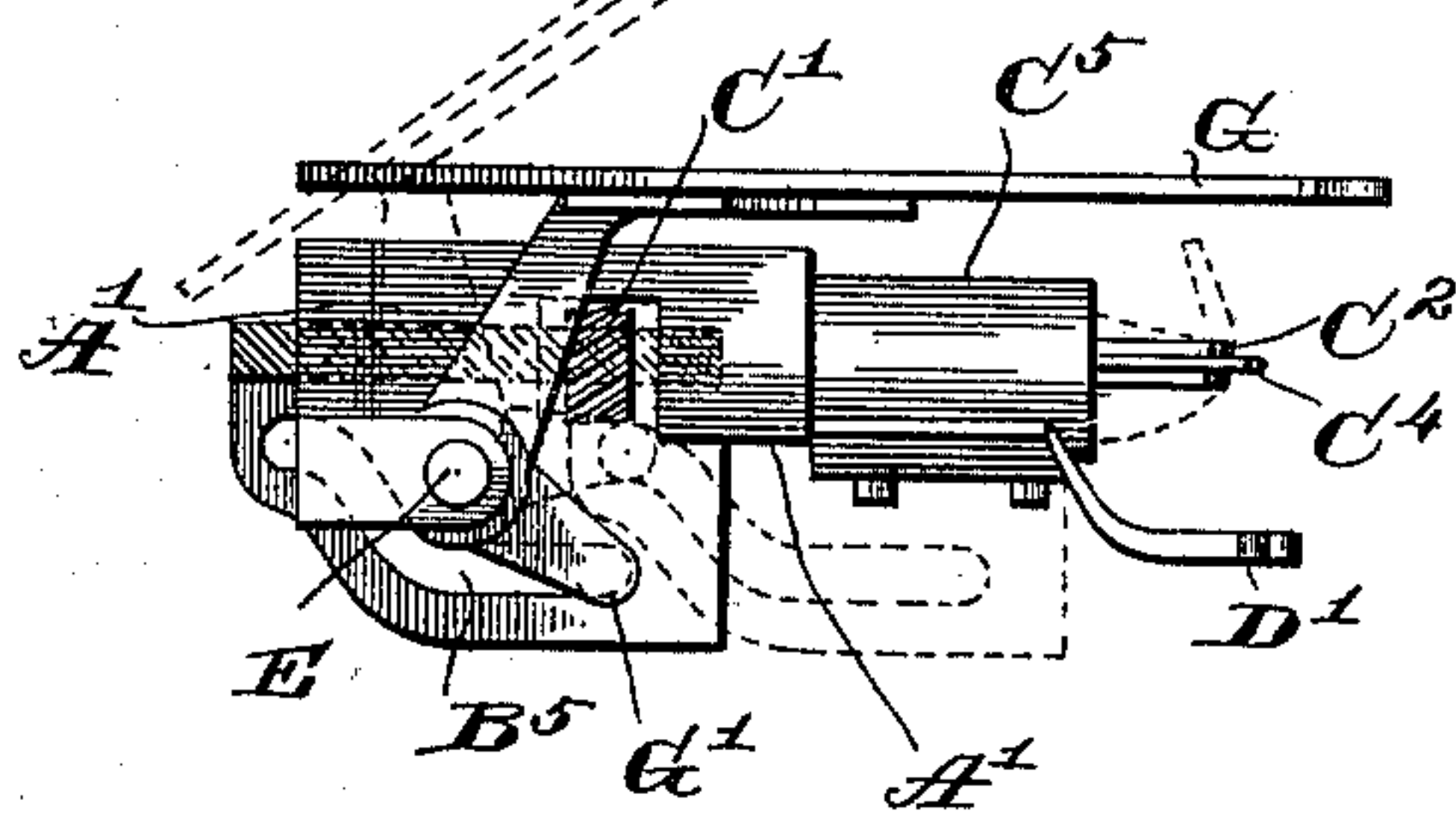


Fig. 18.



Witnesses
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UNITED STATES PATENT OFFICE.

HOWARD D. COLMAN, OF ROCKFORD, ILLINOIS.

KNOT-TYING IMPLEMENT.

SPECIFICATION forming part of Letters Patent No. 672,636, dated April 23, 1901.

Application filed February 20, 1901. Serial No. 48,118. (No model.)

To all whom it may concern:

Be it known that I, HOWARD D. COLMAN, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Knot-Tying Implements, of which the following is a specification.

One object of this invention is the production of a hand-mounted manually-operated knot-tying implement.

A further object is the improvement of knot-tying mechanism generally.

The embodiment herein shown of my invention is adapted to tie spoolers' knots; and it comprises a rotatable tying-bill having a shearing and clamping jaw and a movable stripper for grasping the thread, drawing the knot tight, and pulling it from the tying-bill. The modified form of knotter shown in Figures 16, 17, and 18 omits the means of the stripper mechanism for grasping the threads, depending upon the tension on the threads and the friction of the latter in the stripper-arm for holding said threads in engagement with said arm. The implement is intended to be worn constantly on the left hand of the operator and its mechanism to be operated by a lever adapted to be engaged by the thumb of said hand.

In the accompanying drawings, Fig. 1 is a perspective view showing my improved knot-tying implement with its parts in the positions as indicated in Fig. 5. Fig. 2 is a plan view of the mechanism after the first step in the knot-tying operation. Fig. 3 is a similar view when the tying-bill has been rotated half a revolution from its position in Fig. 2. Fig. 4 is a detail view showing the position of the thread upon the tying-bill after the loose ends have been severed and the knot is about to be pulled off from the end of said bill by the stripper. Fig. 5 is a view after a full revolution from Fig. 2 and just before the thread is pulled by the stripper from the clamping-jaw of the tying-bill. Fig. 6 is a side elevation of the mechanism, taken from the cam side of the implement, the parts being in their normal or starting positions. Fig. 7 is a similar view taken from the opposite side of the implement. Fig. 8 is a rear elevation of the mechanism. Figs. 9 and 10 are sectional detail views of the rotatable tying-bill and the

cam-cylinder which operates the cutting and clamping jaw. Fig. 11 is a front end view of the cam-cylinder. Fig. 12 is a plan view of the sector cam-gear. Fig. 13 is a view of the stripper mechanism, showing it detached from the body of the implement. Fig. 14 is an enlarged detail view of the tying-bill. Fig. 15 is a transverse section through the thread-holding arms E² and F, showing the spring-latch F⁵ and the surrounding parts in detail. Figs. 16, 17, and 18 show a modified form of my knot-tying mechanism. Fig. 16 is a side elevation, Fig. 17 a front elevation, and Fig. 18 a top plan view, of the mechanism embodying said modification.

Like letters of reference indicate corresponding parts throughout the several views.

In the construction of this implement I provide a standard A, having the integral overhanging arms A' at its upper end and the transverse sleeve A² at its lower end. A clip A³ surrounds said sleeve A² and is adapted to have frictional engagement with the outer surface of the sleeve by means of the clamping-screw A⁴. The clip A³ has a downwardly-extending stem A⁵, intended to lie within a suitable opening in the handle A⁶ and be held rigidly in position therein by the set-screw A⁷. The handle A⁶ is provided with a handle-strap A⁸ in loop form for surrounding the hand of the operator, and this loop is made adjustable in size in order to fit the hand of any person. I have shown a buckle for providing this adjustment; but any suitable means may be employed for this purpose. It will be noticed that the stem A⁵ may be turned with relation to the handle A⁶ and the sleeve A² in the clip A³ in order to secure an adjustment of the implement to accommodate it to hands of different forms.

A shaft B is free to oscillate within the sleeve A². At one end this shaft is enlarged and there carries the thumb-fork B', frictionally secured on the end of said shaft by its integral collar B² and the clamping-screw B³. At its opposite end the shaft B carries the sector cam-gear B⁴, pinned to said shaft. The cam-groove B⁵ of the sector cam-gear is cut in the peripheral face of the sector, and the teeth of the gear are of skew-gear form. The cam-groove B⁵ is of an outline somewhat resembling that of the letter U, with its arms

wide-spread and curved outward at their upper ends.

C is a knotter-shaft rotatably mounted in bearings formed in the overhanging arms A' of the standard A and carries the pinion C', the teeth of which are "skewed" to correspond with those of the sector cam-gear B⁴. The pinion C' is affixed to the shaft in any suitable manner. I have shown it as frictionally engaging said shaft; but it may be positively secured thereto in any desired way. This pinion C' is provided with a long hub to occupy wholly the space upon the shaft C between the supporting-arms A', and thus prevent end movement of said shaft.

The forward end of the knotter-shaft C is flattened on one of its sides and bent substantially at right angles to its length, forming the tying-bill C². The slot C³, its plane being parallel with that of the flattened surface of the tying-bill C², is formed in said bill and said shaft C, and within said slot is pivotally mounted the shearing and clamping jaw C⁴. The lower part of this jaw is in wing form, adapted to engage the interior walls of the cam-cylinder C⁵, which latter is rigidly mounted on the standard A. This cam-cylinder is set eccentric to the knotter-shaft C, and its inner form is slightly elliptical in order to produce the proper movement of the shearing and clamping jaw C⁴, the wing of said jaw engaging said internal cam. The flattened side of the tying-bill C² is provided with a shear edge within the slot C³ and the jaw C⁴, pivoted in said slot C³, with a corresponding shear edge. The opposite edge of said jaw is rounded slightly, so that the latter will clamp, while the opposite edge severs the ends of the threads in the tying-bill.

I have now described the mechanism for forming the knot and cutting the thread. I will next describe the stripper mechanism.

A supporting-plate D is secured to the top of the standard A and is provided with the fixed forwardly-extending guide-arm D' for the thread. Rearward of the guide-arm D' is the vertical bearing-sleeve D², and near the opposite edge of the supporting-plate D is an upwardly-extending releasing-stud D³ for a purpose to be mentioned later herein. A stop-stud D⁴ at the forward edge of the supporting-plate limits the forward movement of the stripper mechanism. An oscillatory shaft E is adapted to lie within the vertical bearing-sleeve D², and this shaft carries the two crank-arms E' and E², fixed to said shaft. The former at the lower end of the shaft bears the antifriction-roller E³, adapted to lie within the cam-groove B⁵ of the sector cam-gear B⁴, and the latter at its outer end supports the pivotal arm E⁴, having the upwardly-extending thread-clamping fingers E⁵ fixed thereon. E⁶ is an engaging stud mounted on the upper side of the crank-arm E² near the free end of said arm.

From the foregoing it will be seen that a movement of the sector-cam will produce a

corresponding positive movement of the oscillatory shaft and the arms E² and E⁴.

F is a thread-holding arm loosely mounted by means of its integral ears F' on the oscillatory shaft E and having its outer portion F² bent at an angle with the plane of the body portion thereof. The forward end of the outer portion F² of said thread-holding arm is formed into a rearwardly-extending guide-arm F³ for the thread, between which arm and the fingers E⁵ the thread is clamped during the last part of the knot-tying operation when the knot is being drawn tight and stripped from the tying-bill. The fingers E⁵ embrace the said outer portion F² of the thread-holding arm F, one finger lying on each side thereof. A spring F⁴, coiled about the oscillatory shaft E, is attached at its ends to the arm E² and the thread-holding arm F, and by its elasticity tends to hold the said arms apart. The stop-stud D⁴ limits the forward movement of the thread-holding arm F, and the antifriction-roller E³ on the arm E', engaging the rear end of the cam-groove B⁵, forms a stop for the rearward movement of the arm E². A spring-latch F⁵ is pivotally mounted by the stud F⁶ on the thread-holding arm F and is adapted to engage the stud E⁶ on the arm E², and thereby hold the thread-holding arm F and the arm E² together, a spring coiled about the pivotal stud F⁶ tending to hold said latch in engagement with the stud. The latch F⁵ has an integral arm F⁷ extending substantially at right angles thereto, and a pin F⁸, fixed in said arm F⁷, extends downward through a slightly-elongated opening F⁹ in the thread-holding arm F into a position to be engaged by the upwardly-extending releasing-stud D³, which stud by delaying said pin rocks the latch F⁵ on its pivot and withdraws it from its engagement with the stud E⁶. The pin F⁸ when so rocked is at the end of the elongated opening F⁹, and further rearward movement of the arm F is thus stopped. The arm E², however, moves rearward slightly farther to positively pull the fingers E⁵ from engagement with the guide-arm F³, between which fingers and arm the thread is wedged. When this is done, the spring F⁴ separates the arm E² and the thread-holding arm F, the former seeking its rear most and the latter its foremost position. The guide-arm F³ is formed a little thicker than the thread-holding arm F, so that while the fingers E⁵ slide freely on the body of said arm they will tightly engage the guide-arm in order thereto firmly grasp the thread.

In the operation of the implement the left hand of the operator is slipped within the handle-strap A⁸, the loop being adjusted to the size of the operator's hand. The thumb is placed within the thumb-fork B' and the latter thrown into the position it is shown to occupy in Fig. 6, its highest position. The ends of the thread intended to be united lying side by side are then drawn with the right hand of the operator over the outer end

F² of the thread-holding arm F and the guide-arm D', and these being inclined downward the two threads naturally seek the forward ends of the thread-holding arm and guide-arm, passing also across the knotter-shaft C, directly under the point of the tying-bill C². A downward pressure of the thumb upon the fork B' moves the sector cam-gear B⁴, and this rotates the knotter-shaft C by reason of its skew-gear engagement. The first quarter of a revolution of the tying-bill C² turns it into the position indicated in Fig. 2, the point of the bill lying over the threads. During this quarter of a revolution of the knotter-shaft C the sector cam-gear B⁴ is turned, causing the roller E³ on the arm E' to travel outward a little distance in the cam-groove B⁵, oscillating the shaft E and moving forward the arm E² and the pivotal arm E⁴, with its clamping-fingers E⁵, the latter sliding forward one on either side of the outer portion F² of the thread-holding arm F, as shown by Fig. 2 of the drawings. Continued downward movement of the thumb-fork continues the forward movement of the clamping-fingers E⁵ until as the roller E³ reaches the lowest point in the cam-groove B⁵ the fingers E⁵ coincide with and embrace the outer end of the thread-holding arm F, clamping the thread between the fingers and the guide-arm F³, and during the same time the stud E⁶ is moved into engagement with the spring-latch F⁵, locking the arm E² and the thread-holding arm F together, as shown by Fig. 3 of the drawings. At this point the tying-bill has been rotated through three-quarters of a revolution, and by reason of the interior conformation of the cam-cylinder C⁵ its shearing and clamping jaw C⁴ is open, ready to receive the thread during the next quarter-revolution. Continued downward movement of the thumb-fork B' throws the uptending or return side of the cam-groove B⁵ into contact with the roller E³, and as the tying-bill is turned into the positions indicated in Figs. 4 and 5 the thread-holding arm F and the arm E² are thrown backward and outward, stripping the knot from the end of the tying-bill, the cam-surface within the cam-cylinder C⁵ having previously closed the shearing and clamping jaw C⁴ to cut off the threads and to hold the short ends thus formed while the knot is being stripped off the tying-bill by said backward movement of the clamping-fingers E⁵ with the thread-holding arm F. When the tying-bill reaches the position indicated in Fig. 5, the ends of the thread will be pulled from the bill, and the pin F⁸, having now engaged the releasing-stud D³, further rearward movement of the arm E² causes the latch F⁵ to be disengaged from the stud E⁶ and the fingers E⁵ to be withdrawn from the guide-arm F³, whereupon the spring F⁴ throws the thread-holding arm into its forward position against the stop-pin D⁴. The thread is now free to be withdrawn and the thumb-fork B' is again thrown upward into its initial position, as indicated in

Figs. 6, 7, and 8. During this upward movement of the thumb-fork B' the mechanism is operated as just described, except that the knotter-bill is rotated in the opposite direction. The arm E² and the thread-holding arm F will be engaged and moved backward together until the pin F⁸ encounters the releasing-stud D³, when the latch F⁵ will release the stud E⁶, and the thread-holding arm F will be thrown into its forward position by the spring F⁴.

In the modified form shown in Figs. 16, 17, and 18 the construction is considerably simplified by the omission of the mechanism for grasping the threads when stripping them from the tying-bill. In this modified form an oscillatory stripping-arm G has a bell-crank G' in the cam-groove B⁵ of the sector cam-gear B⁴. The cam-groove B⁵ in the modified form is made straight at one end. Therefore it will be seen that the stripping-arm G will have a positive oscillatory movement backward and forward with relation to the tying-bill. When the thumb-lever B' is in its upward or normal position, the stripping-arm G will be adjacent to the tying-bill; but when the thumb-lever B' is at its lowest position the stripping-arm G will stand at a little distance from the tying-bill. The tension of the threads from the spools (not shown) and the friction of said threads in the thread-guide of the oscillating stripper-arm G cause the knot to be tightened and said threads to be stripped from the tying-bill C² when the oscillating arm G is moved outward from said tying-bill. The operation of the modified form is the same as hereinbefore described.

I claim as my invention—

1. In a knot-tying implement, in combination, mechanism for automatically forming a knot; means for securing said mechanism to the hand of the operator; and means for manually operating said automatic mechanism to form a knot.

2. In a knot-tying implement, in combination, mechanism for automatically forming a knot; means for securing said mechanism to the hand of the operator; and means for digitally operating said automatic mechanism to form a knot.

3. In a knot-tying implement, in combination, mechanism for automatically forming a knot; means for securing said mechanism to the hand of the operator; and a lever adapted to be manually operated, for operating said automatic mechanism.

4. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; and a lever adapted to be digitally operated, for operating said knot-forming mechanism.

5. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; and means adapted to be operated by a movement of a digit of the hand to which

ing said tying-bill to the hand of the operator; and a lever adapted to be operated by a movement of a digit of the hand to which the implement is secured, for rotating said tying-bill.

17. In a knot-tying implement, in combination, a rotatable tying-bill; means for securing said tying-bill to the hand of the operator; and a lever adapted to be operated by a movement of the thumb of the hand to which the implement is secured, for rotating said tying-bill.

18. In a knot-tying implement, in combination, a rotatable tying-bill; means for securing said tying-bill to the hand of the operator; and a pivoted arm adapted to be operated by a movement of the hand to which the implement is secured, for rotating said tying-bill.

19. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating said knot-forming mechanism; and means adapted to be manually operated for driving said gear.

20. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating 95 said knot-forming mechanism; and means for digitally driving said gear.

21. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating said knot-forming mechanism; and a lever adapted to be manually operated for driving said gear.

22. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating said knot-forming mechanism; and a lever adapted to be digitally operated for driving said gear.

23. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating 115 said knot-forming mechanism; and means adapted to be operated by a movement of a digit of the hand to which the implement is secured, for driving said gear.

24. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating said knot-forming mechanism; and means adapted to be operated by a movement of the thumb of the hand to which the implement is secured, for driving said gear.

25. In a knot-tying implement, in combination, a knot-forming mechanism; means for securing said mechanism to the hand of the operator; intermeshing gear for operating said knot-forming mechanism; and a lever

ing said tying-bill to the hand of the operator;
intermeshing gear for rotating said tying-bill;
and a lever adapted to be operated by the
thumb of the hand to which the implement 70
is secured, for driving said gear.

36. In a knot-tying implement, in combination, a rotatable tying-bill; means for securing said tying-bill to the hand of the operator; intermeshing gear for rotating said tying-bill; 75 and a pivoted arm adapted to be operated by a movement of the hand to which the implement is secured, for driving said gear.

37. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; means for securing said knot-forming mechanism and said knot-tightening mechanism to the hand of the operator; and means adapted to be manually operated for operating the knot-forming mechanism and the mechanism for tightening the knot.

38. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; means for securing said knot-forming mechanism and said knot-tightening mechanism to the hand of the operator; and means adapted to be operated by the movement of a digit of the hand to which the implement is secured, for operating the knot-forming mechanism and the knot-tightening mechanism.

39. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; means for securing said knot-forming mechanism and said knot-tightening mechanism to the hand of the operator; and means adapted to be operated by the movement of the thumb of the hand to which the implement is secured, for operating the knot-forming mechanism and the knot-tightening mechanism.

40. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; means for securing said knot-forming mechanism and said knot-tightening mechanism to the hand of the operator; and a lever adapted to be moved by the thumb of the hand to which the implement is secured, for operating the knot-forming mechanism and the knot-tightening mechanism.

41. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; skew-gear for operating said knot-forming mechanism; a cam for operating the knot-tightening mechanism; means for securing said mechanisms to the hand of the operator; and means for manually driving said gear and moving said cam.

42. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; skew-gear for operating said knot-forming mechanism; a cam for operating the knot-tightening mechanism; means for securing said mechanisms to the hand of the operator; and means adapted to

be operated by a movement of a digit of the hand to which the implement is secured, for moving said skew-gear and said cam.

43. In a knot-tying implement, in combination, a knot-forming mechanism; mechanism adapted to tighten the knot; skew-gear for operating said knot-forming mechanism; a cam for operating the knot-tightening mechanism; means for securing said mechanisms to the hand of the operator; and a lever adapted to be operated by the movement of the thumb of the hand to which the implement is secured, for moving said skew-gear and said cam.

44. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread and tighten the knot; means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a digit of the hand to which the implement is secured, for operating the knot-forming mechanism to form a knot, and for moving said thread-holding mechanism relatively to the knot-forming mechanism, to draw up the slack in the thread to tighten the knot.

45. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding arm adapted to clamp the thread and move away from the knot-forming mechanism to draw up the slack in the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a digit of the hand to which the implement is secured, for operating the knot-forming mechanism to form a knot, and for operating said thread-holding arm.

46. In a knot-tying implement, in combination, a knot-forming mechanism; an oscillatory thread-holding arm adapted to clamp the thread and move away from the knot-forming mechanism to draw up the slack in the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a digit of the hand to which the implement is secured, for operating the knot-forming mechanism to form a knot, and for moving said oscillatory arm.

47. In a knot-tying implement, in combination, a rotatable tying-bill; a thread-holding mechanism adapted to clamp the thread, to strip the thread from the tying-bill and to draw up the slack therein to tighten the knot; means for securing said mechanism to the hand of the operator; and means adapted to be operated by a digit of the hand to which the implement is secured, for rotating said tying-bill and for operating said thread-holding mechanism.

48. In a knot-tying implement, in combination, a rotatable tying-bill; intermeshing gear for rotating said tying-bill; an oscillatory thread-holding arm adapted to clamp the thread and move away from the tying-bill to strip the thread from the tying-bill and draw up the slack in the thread to tighten the knot;

means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a digit of the hand to which the implement is secured, for driving said gear and for moving said arm.

49. In a knot-tying implement, in combination, a knot-forming mechanism; means for operating said mechanism to form a knot; an oscillatory shaft; a thread-holding arm loosely mounted thereon, but capable of being held with relation thereto; means for clamping the thread to said arm; means for releasably holding said arm with relation to said shaft, so it will rotate therewith; and means for oscillating said shaft and moving said arm away from the knot-forming mechanism to tighten the knot.

50. In a knot-tying implement, in combination, a knot-forming mechanism; means for operating said mechanism to form a knot; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft but capable of being locked with relation thereto; means for clamping the thread to said arm; means for oscillating said arm; and a latch for locking said arm with relation to said shaft.

51. In a knot-tying implement, in combination, a tying-bill; means for rotating said tying-bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft, but capable of being held with relation thereto, which arm is adapted to clamp the thread and move away from the tying-bill to draw up the slack in the thread to tighten the knot and pull the thread from said tying-bill; and means for releasably holding said thread-holding arm with relation to said shaft so it will rotate therewith, and for releasing said arm from movement with said shaft.

52. In a knot-tying implement, in combination, a rotatable tying-bill; means for rotating said bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft, but capable of being locked with relation thereto; a clamp for holding the thread to said arm; means for oscillating said shaft; means for releasably locking said arm with relation to said shaft; and means for operating said thread-clamp.

53. In a knot-tying implement, in combination, a rotatable tying-bill; means for rotating said bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft, but capable of being locked with relation thereto; means for clamping the thread to said arm; and means for releasably locking said arm with relation to said shaft, and for releasing said arm from movement with said shaft.

54. In a knot-tying implement, in combination, a rotatable tying-bill; means for rotating said bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft, but capable of being locked with relation thereto; an arm rigidly fixed to said oscillatory shaft; means for releasably locking said thread-holding arm in engagement with

said last-mentioned arm; means for clamping the thread to said thread-holding arm; and means for oscillating said shaft.

55. In a knot-tying implement, in combination, a rotatable tying-bill; intermeshing gear for rotating said tying-bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft, but capable of being locked with relation thereto; an arm fixed to said shaft; means for releasably locking said thread-holding arm in engagement with said last-mentioned arm; means for clamping the thread to said thread-holding arm; a cam for oscillating said shaft; and an arm on said shaft for engaging said cam.

56. In a knot-tying implement, in combination, a tying-bill; means for rotating said tying-bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft; an arm fixed on said oscillatory shaft; a spring-latch for connecting said thread-holding arm to said last-mentioned arm; means for disengaging said spring-latch; a clamp for the thread, on said thread-holding arm; a cam for oscillating said shaft; and an arm fixed on said shaft, for engaging said cam.

57. In a knot-tying implement, in combination, a tying-bill; a shearing and clamping jaw for said bill; a cam for operating said jaw; a gear for rotating said bill; an oscillatory shaft; a cam for moving said shaft; a thread-holding arm loosely mounted on said oscillatory shaft; an arm fixed on said oscillatory shaft; a spring-latch for engaging said thread-holding arm with said last-mentioned arm; and a clamp for the thread, on the thread-holding arm.

58. In a knot-tying implement, in combination, a tying-bill; intermeshing gear for rotating said tying-bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft; an arm fixed on said oscillatory shaft; a spring-latch for connecting said thread-holding arm to said last-mentioned arm; means for releasing said latch; clamping-fingers for the thread, having a sliding engagement with the thread-holding arm, and a pivotal engagement with the before-mentioned arm fixed on said oscillatory shaft; a cam for oscillating said shaft; and an arm fixed on said shaft for engaging said cam.

59. In a knot-tying implement, in combination, a tying-bill; intermeshing gear for rotating said tying-bill; an oscillatory shaft; a thread-holding arm loosely mounted on said shaft; an arm fixed on said oscillatory shaft; a spring-latch for connecting said thread-holding arm to said last-mentioned arm; a stop projection for disengaging said latch; a spring extending between the thread-holding arm and the said arm fixed on the oscillatory shaft; clamping-fingers for the thread, having a sliding engagement with said thread-holding arm, and a pivotal engagement with the arm fixed on said oscillatory shaft; a cam for oscillating said shaft; an arm fixed on said shaft, for engaging said cam; means for

attaching mechanism to the hand of the operator; and a pivotal thumb-lever for operating said mechanism.

60. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and means for manually operating the knot-forming mechanism and the thread-holding mechanism.

61. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and means for digitally operating the knot-forming mechanism and the thread-holding mechanism.

62. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and a lever adapted to be manually operated, for operating the knot-forming mechanism and the thread-holding mechanism.

63. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and a lever adapted to be digitally operated, for operating the knot-forming mechanism and the thread-holding mechanism.

64. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a movement of a digit of the hand to which the implement is secured, for operating the knot-forming mechanism and the thread-holding mechanism.

65. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a movement of the thumb of the hand to which the implement is secured, for operating the knot-forming mechanism and the thread-holding mechanism.

66. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread and tighten the knot; means for securing said mechanisms to the hand of the operator; and means adapted to be operated by a digit of the hand to which the implement is secured, for operating the knot-forming mechanism to form the knot, and the thread-holding mechanism to hold the thread and draw up the slack therein to tighten the knot.

67. In a knot-tying implement, in combina-

tion, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and a lever adapted to be operated by a digit of the hand to which the implement is secured, for operating the knot-forming mechanism and the thread-holding mechanism..

68. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and a lever adapted to be operated by the thumb of the hand to which the implement is secured, for operating the knot-forming mechanism and the thread-holding mechanism.

69. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread to tighten the knot; means for securing said mechanisms to the hand of the operator; and a pivoted arm adapted to be operated by a movement of the hand to which the implement is secured, for operating the knot-forming mechanism and the thread-holding mechanism.

70. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread and tighten the knot; means for securing said mechanisms to the hand of the operator; and means for manually operating the knot-forming mechanism, and for moving the thread-holding mechanism relatively to the knot-forming mechanism.

71. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread and tighten the knot; means for securing said mechanisms to the hand of the operator; and means for digitally operating the knot-forming mechanism, and for moving the thread-holding mechanism relatively to the knot-forming mechanism.

72. In a knot-tying implement, in combination, a knot-forming mechanism; means for manually operating said knot-forming mechanism to form a knot; a thread-holding arm adapted to clamp the thread and move away from the knot-forming mechanism to draw up the slack in the thread to tighten the knot; means for securing the knot-forming mechanism to the hand of the operator; and means manually operated for operating said thread-holding arm.

73. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread, and to draw up the slack therein to tighten the knot; intermeshing skew-gear for operating the knot-forming mechanism; and means for manually moving said thread-holding mechanism relatively to the knot-forming mechanism and for driving said skew-gear.

74. In a knot-tying implement, in combination, a knot-forming mechanism; a thread-holding mechanism adapted to clamp the thread and tighten the knot; means for securing said mechanisms to the hand of the operator; and an arm for manually operating the knot-forming mechanism and the thread-holding mechanism.

75. In a knot-tying implement, in combination, a knot-forming mechanism; means for manually operating said mechanism to form a knot; an oscillatory shaft; a thread-holding arm loosely mounted thereon; means for clamping the thread to said arm; means manually operated for oscillating said shaft and moving said arm away from the knot-forming mechanism to tighten the knot; and means for securing the knot-forming mechanism to the hand of the operator.

76. In a knot-tying implement, in combination, a knot-forming mechanism; means for digitally operating said mechanism to form a knot; an oscillatory shaft; a thread-holding arm loosely mounted thereon; means for clamping the thread to said arm; means digitally operated for oscillating said shaft and moving said arm away from the knot-forming mechanism to tighten the knot; and means for securing the knot-forming mechanism to the hand of the operator.

77. In a knot-tying implement, in combination, a knot-forming mechanism; a lever adapted to be manually operated for operating said mechanism to form a knot; an oscillatory shaft; a thread-holding mechanism loosely mounted thereon; means for clamping the thread to said arm; means manually operated for oscillating said shaft and moving said arm away from the knot-forming mechanism to tighten the knot; and means for securing the knot-forming mechanism to the hand of the operator.

78. In a knot-tying implement, in combination, a rotatable tying-bill; a thread-holding mechanism adapted to strip the thread from the tying-bill and tighten the knot; means for securing said mechanisms to the hand of the operator; and a lever adapted to be operated by a movement of the hand to which the implement is secured, for operating said thread-holding mechanism.

79. In a knot-tying implement, in combination, a rotatable tying-bill; a thread-holding mechanism adapted to strip the thread from the tying-bill and tighten the knot; skew-gear for rotating said tying-bill; means for operating the knot-tightening mechanism; means for securing the implement to the hand of the operator; and a lever adapted to be operated by a movement of the hand to which the implement is secured, for driving the skew-gear and the means for operating the knot-tightening mechanism.

80. In a knot-tying implement, in combination, a rotatable tying-bill; intermeshing skew-gear for rotating said tying-bill; means for securing the implement to the hand of

the operator; and a pivoted arm adapted to be operated by a movement of the hand to which the implement is secured, for driving said skew-gear.

- 5 81. In a knot-tying implement, in combination, a tying-bill; intermeshing skew-gear for rotating said tying-bill; a hand-loop for securing the implement to the hand of the op-

erator; and a thumb-lever adapted to be moved by the thumb of the operator, for driving said skew-gear.

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Witnesses:

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