

R. CUNNINGHAM.
MACHINE FOR FOLDING HANDKERCHIEFS AND LIKE ARTICLES.
APPLICATION FILED DEC. 11, 1908.

970,424.

Patented Sept. 13, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

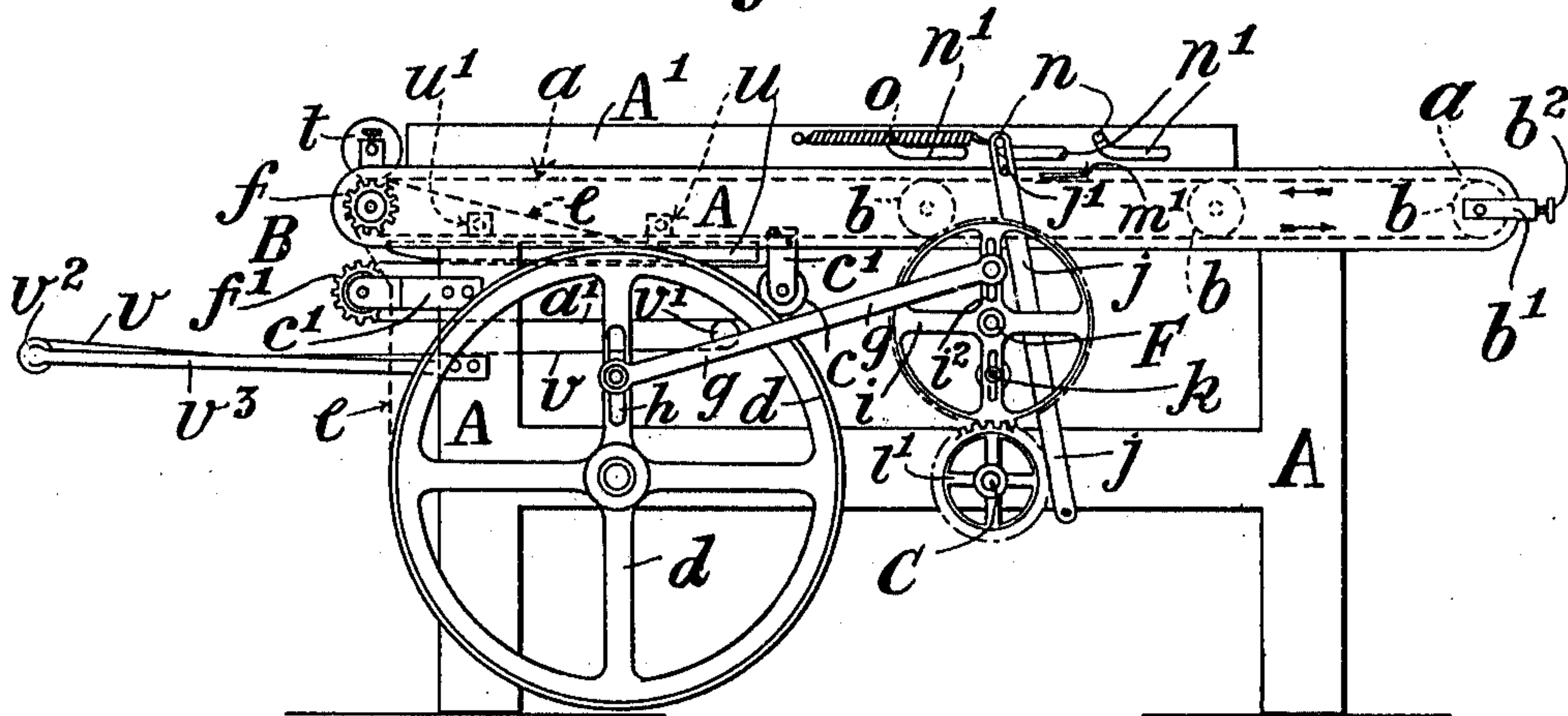
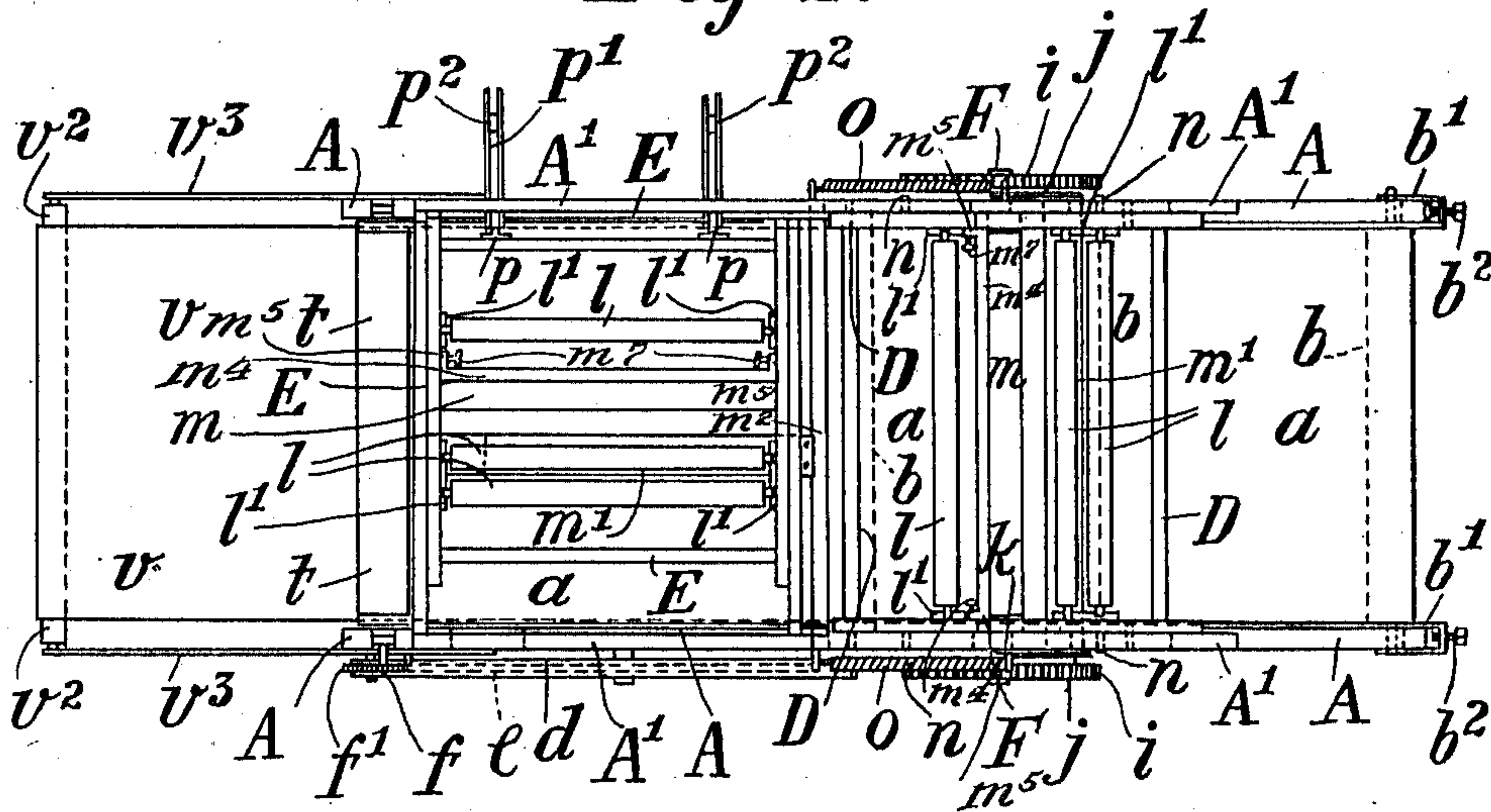


Fig. 2.



Witnesses:
O. F. Nagle.
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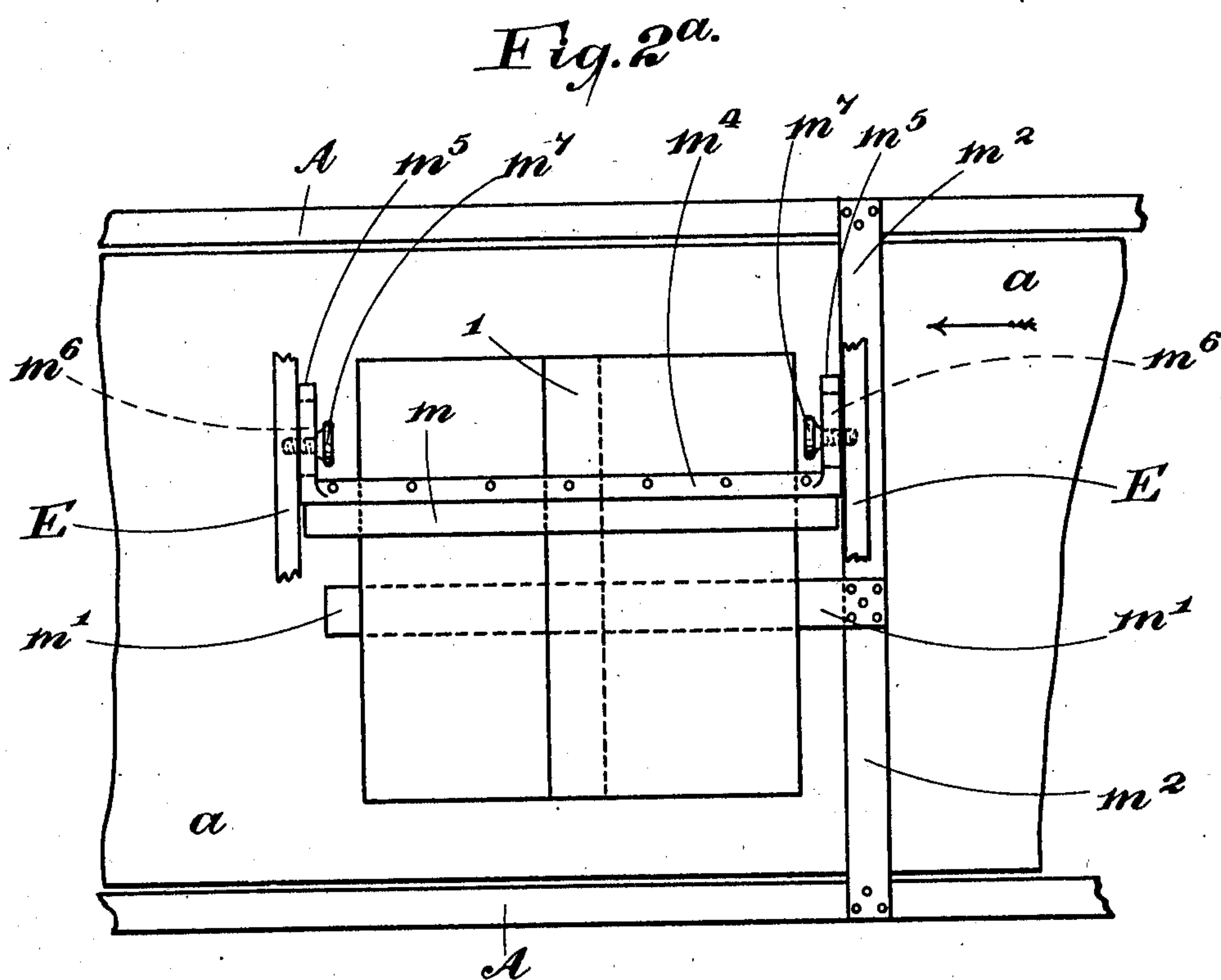
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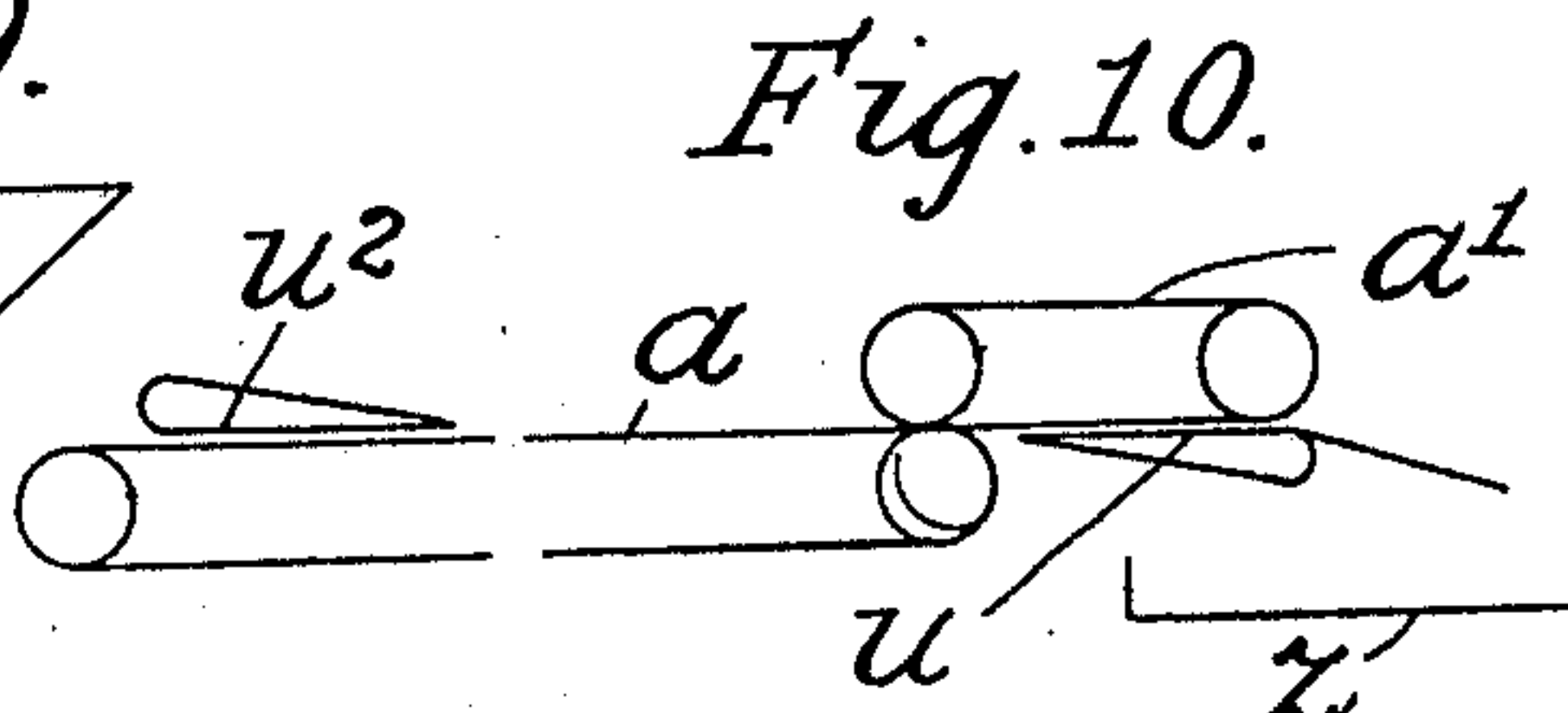
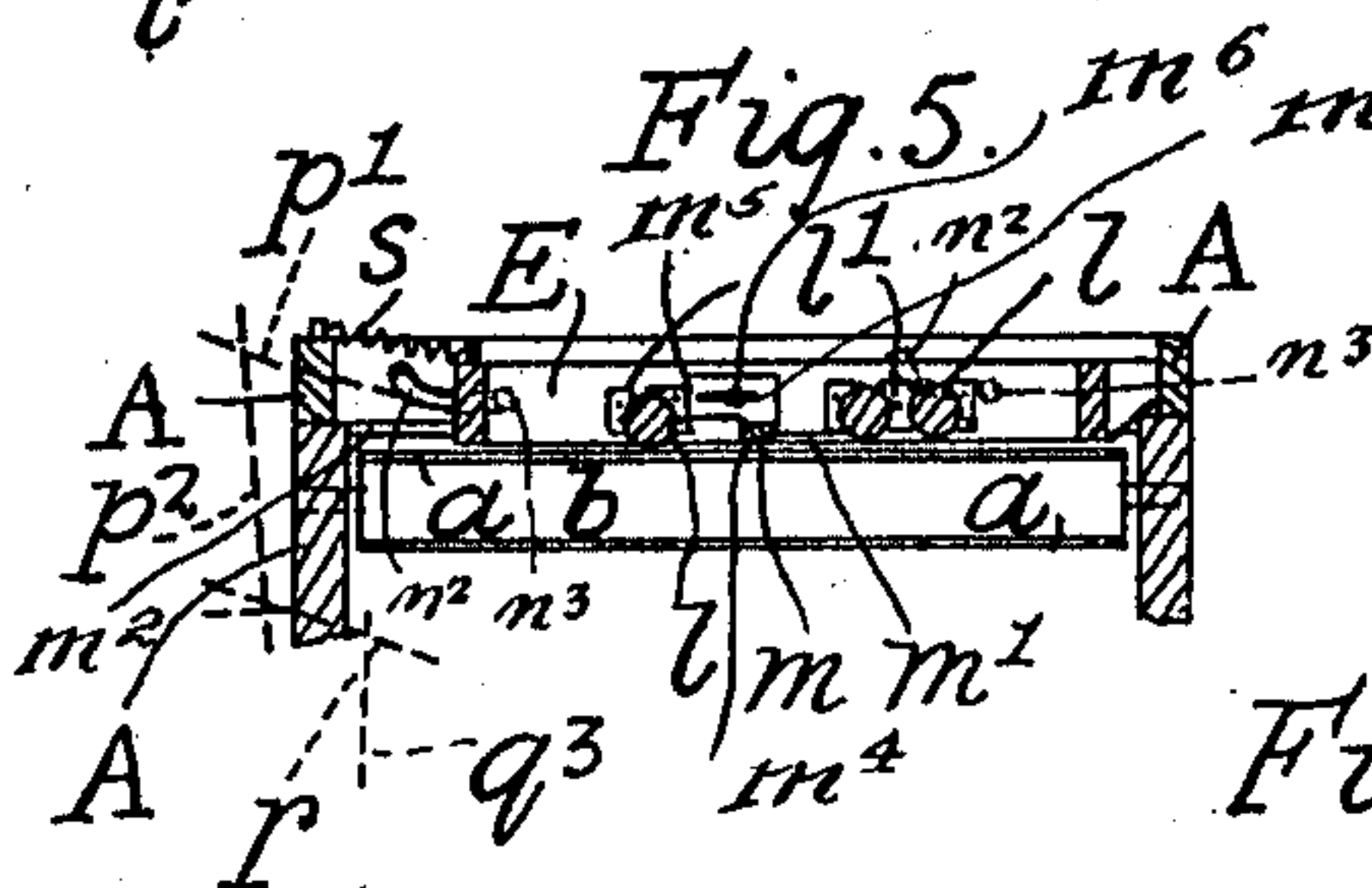
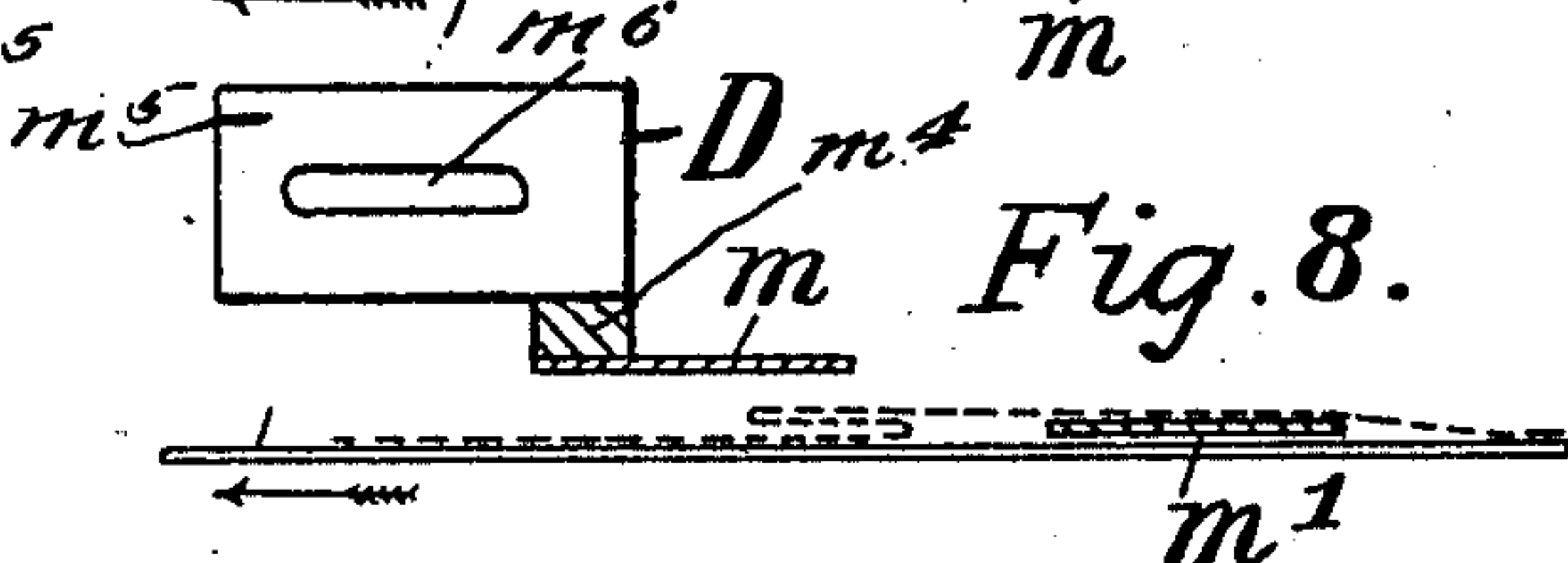
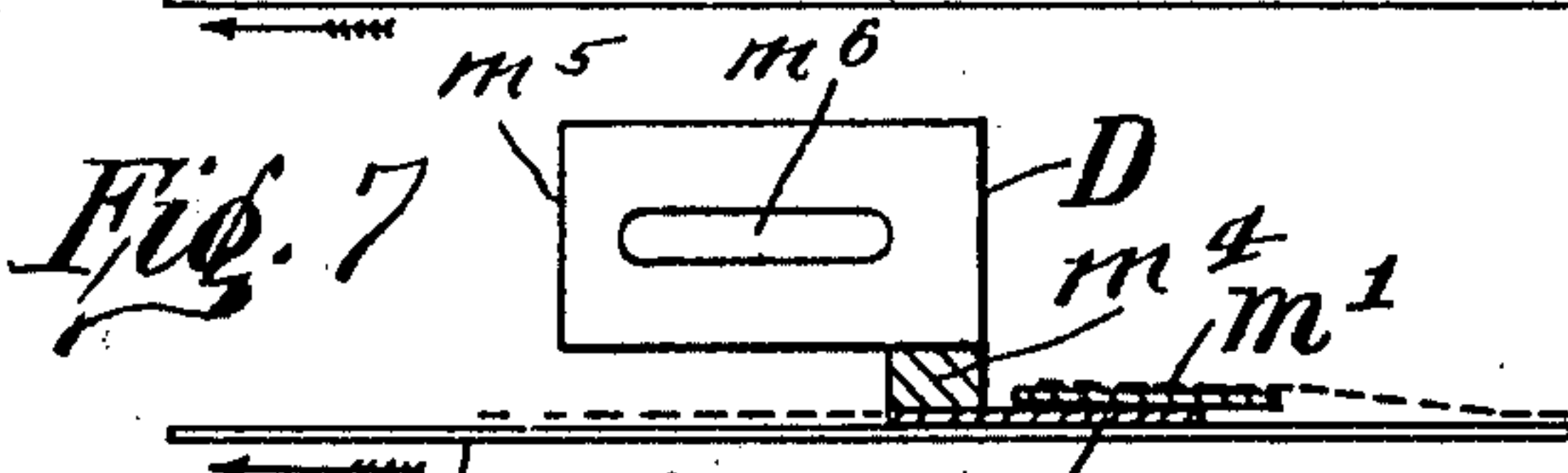
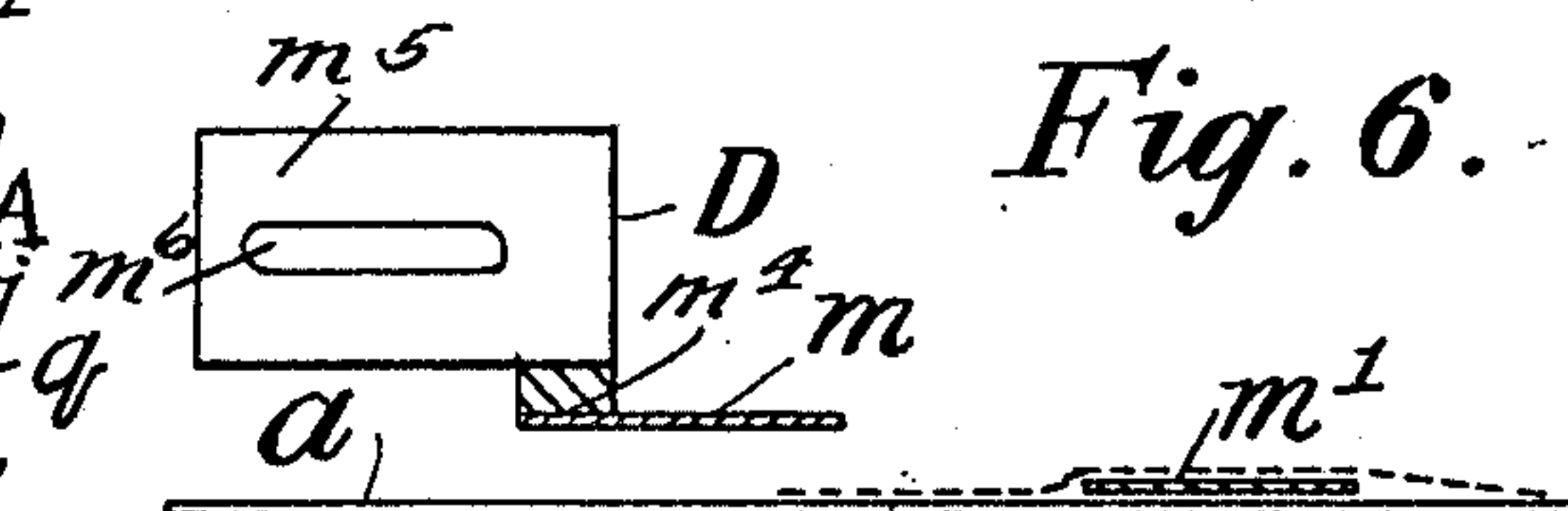
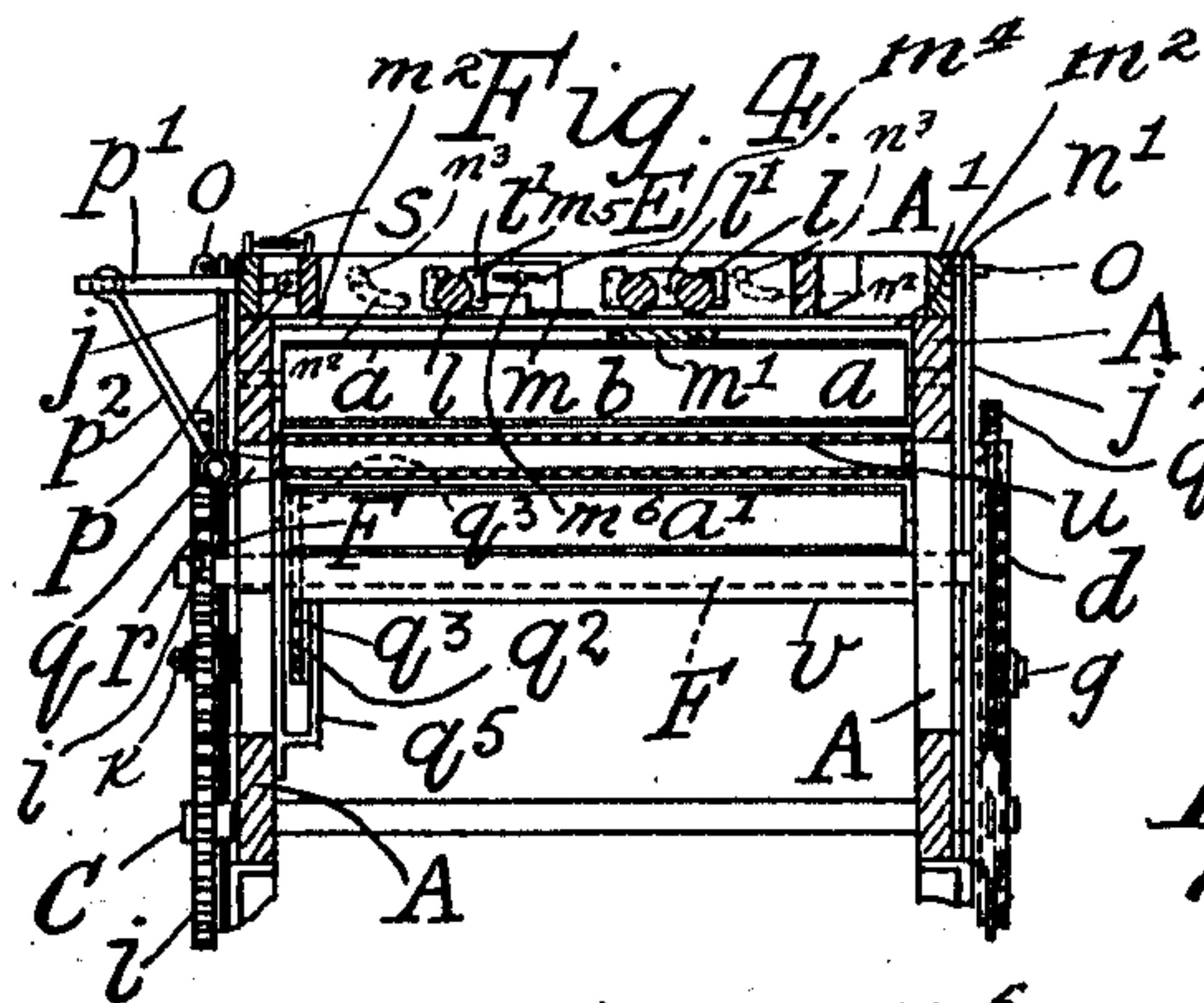
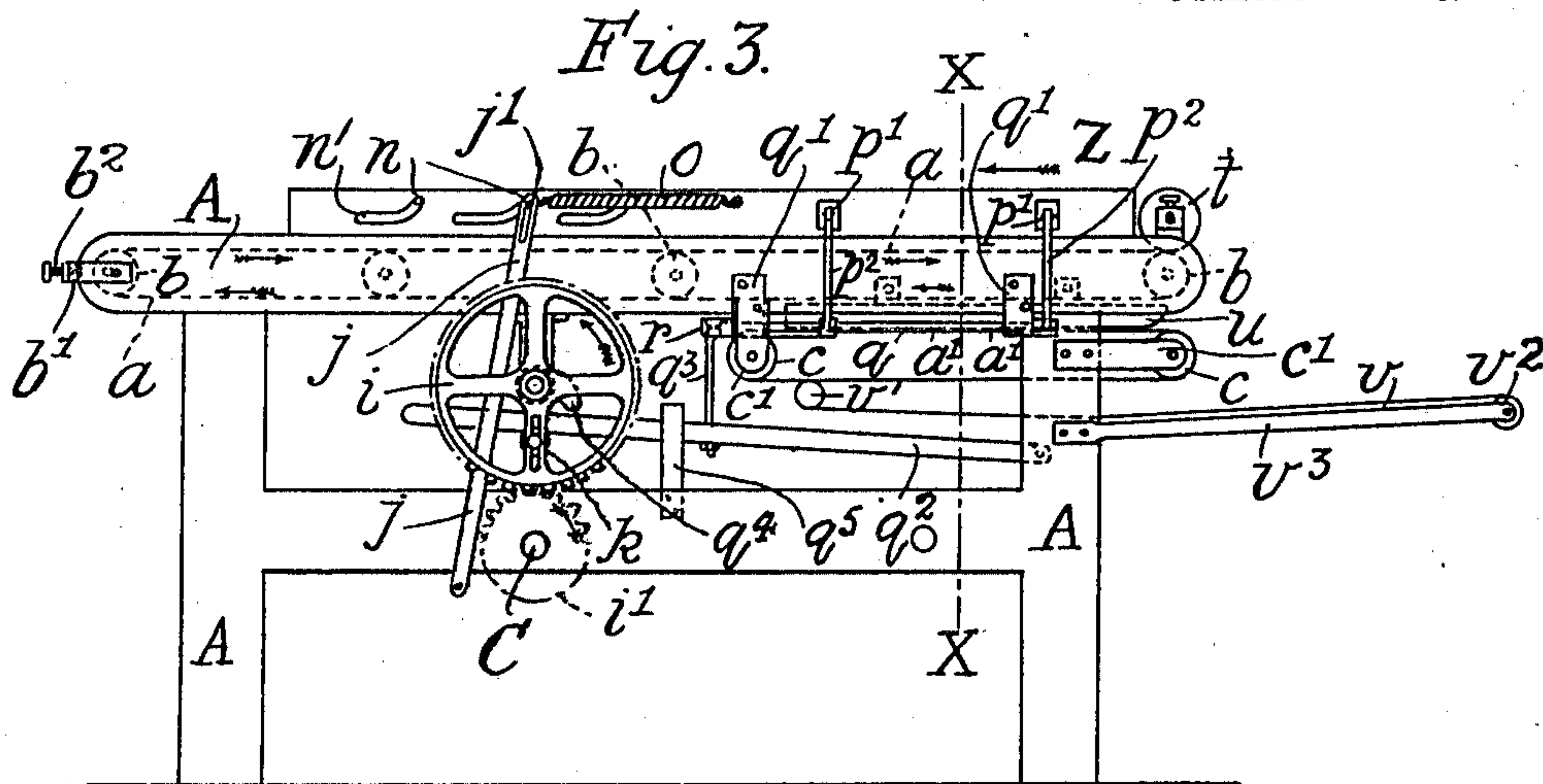


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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

ROBERT CUNNINGHAM, OF BELFAST, IRELAND.

MACHINE FOR FOLDING HANDKERCHIEFS AND LIKE ARTICLES.

970,424.

Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed December 11, 1908. Serial No. 466,996.

To all whom it may concern:

Be it known that I, ROBERT CUNNINGHAM, a subject of the King of Great Britain, residing at Belfast, Ireland, have invented a certain new and useful Machine for Folding Handkerchiefs and Like Articles, of which the following is a specification.

This invention relates to the folding of handkerchiefs and like articles from their original sizes to a given size preparatory to inserting them in a box or like receptacle. This operation is generally termed "box-folding" and has hitherto been usually performed by hand, considerable dexterity and neatness being required on the part of the operator. Under my invention I use a machine for this purpose by means of which greater accuracy is insured in the folding operations while a much larger quantity of work can be got through in a given time. Moreover the machine is so constructed that it can be adjusted to suit various sizes of articles while the fold can be made larger or smaller as required.

In order that my said invention may be properly understood I have hereunto appended two explanatory sheets of drawings, whereon:—

Figure 1 is a view of one side of the machine as constructed under this invention. Fig. 2 is a plan view of the machine. Fig. 2^a is a partial plan view of part of the machine showing the arrangement of the blades m , m^1 , for making the second fold in the handkerchief or other article. Fig. 3 is a view of the other side of the machine. Fig. 4 is a cross section taken on the line X, X, Fig. 3 and looking in the direction of the arrow Z. Fig. 5 is a similar cross section showing the frame E down and the knives or blades m , m^1 in position for forming the fold. Figs. 6, 7 and 8 are diagrammatic views showing respectively the position of blades m , m^1 before, during and after each folding operation. Fig. 9 is a perspective view of a handkerchief or other article showing the two folds formed therein. Fig. 10 shows a diagrammatic view of a slightly modified arrangement of the traveling bands a , a^1 and the smoothing device u .

In carrying out my invention the machine consists of a framework A of suitable length and width which is provided with an end-

less flexible traveling band a preferably made from a suitable stout woven fabric and supported on a number of rollers b fitted in bearings in the framework A. The spindle of the roller b , at the front end of the machine, works in slots made in the framework A and is preferably provided at each side with suitable adjusting mechanism such as a sliding bracket b^1 and screw b^2 , the spindle of the roller being arranged to project through the brackets. With this arrangement the tension on the band a can be varied as required by rotating the screws b^2 while the portion of the band for the time being uppermost forms a flat or table top. A second endless traveling band a^1 is provided a short distance below the band a and works on rollers c fitted in bearings c^1 secured to the framework A.

The band a which carries the handkerchiefs or other articles to be folded, from one end of the machine to the other, and the band a^1 , situated below the band a , are actuated simultaneously and intermittently by means of a driving wheel d or its equivalent which only partially rotates and which is provided with a chain or other suitable drive e secured thereto by means of set screws or the like, which chain e gears with a toothed wheel f fitted on the spindle of the roller b at the back end B of the machine, which wheel, when rotated in one direction, runs loosely on its spindle, but when rotated in the other direction, causes the spindle to rotate with it as in the well known bicycle "free wheel". The chain e also gears with a second toothed wheel f^1 secured to the spindle of one of the rollers c of the endless band a^1 . With this arrangement of gearing, the necessary movement, in the desired direction, is given to the bands a , a^1 when required.

The driving wheel d receives its partial rotary motion through a connecting rod or lever g one end of which works in a slot h formed in the wheel d while its other end is connected to a toothed wheel i fitted on a shaft F gearing with a second wheel i^1 fitted on the driving shaft C of the machine said driving shaft being actuated by power or hand as desired. The toothed wheel i is provided with a slot i^2 into which the end of the lever g is adjustably secured for the pur-

pose of varying the amount of movement of the wheel d and consequently the movements of the bands a and a^1 .

Adjustably fitted on the toothed wheel i at each side of the machine is a projecting stud having a roller k fitted loosely thereon, said roller being so arranged that at each revolution of the wheel i it comes in contact with and actuates an oscillating lever j connected with the folding mechanism as will be hereinafter described.

The folding mechanism preferably consists of two suitable moving frames D, E, the frame D being for the purpose of producing the transverse fold 1, and the frame E the longitudinal fold 2 shown in the perspective view of the handkerchief or like article at Fig. 9. In each of these frames the construction is practically the same but the method of actuating is necessarily slightly different. The frame D, as shown, is of a somewhat rectangular shape and is provided with pressing or smoothing rollers l fitted in bearings l^1 . A metal blade or knife m is suitably secured to the underside of the frame D and moves longitudinally with same, while a second fixed blade or knife m^1 is secured to the framework A immediately above the surface of the endless band a . Pins n are fitted on the sides of the frame D and project through curved slots n^1 made in guide pieces A^1 which are secured to the framework A. At each side of the machine the oscillating lever j is provided with a slot j^1 at its upper end into which projects one of the pins or the like n and the arrangement is such that when the levers j oscillate the pins n are caused to traverse the slots n^1 thereby moving the frame D in a downward and horizontal direction against the action of the spiral springs or their equivalent o thereby, firstly, bringing the blade or knife m close to the upper surface of the band a and, secondly, carrying it below the fixed blade or knife m^1 . This movement is clearly illustrated at Figs. 4 and 5 as applied to the frame E and the action is the same in the case of the frame D being described. When the toothed wheels i in their rotation carry the roller bearings or their equivalent k once more clear of the oscillating levers j the frame D again assumes its original raised position under the action of the springs o .

From this description it will be seen that while the frame D is caused to move in a downward and horizontal direction longitudinally of the machine framework A, under the action of the oscillating levers j and roller bearings k , for the purpose of producing the transverse fold 1 in the handkerchief or other article being folded, in the case of the frame E, in which the pressing or smoothing rollers l and the movable

and fixed blades or knives m, m^1 are arranged at right angles to the rollers and blades in the frame D, the movement is in a downward and horizontal direction transverse of the machine framework A.

In order to illustrate more clearly the arrangement of the blades m, m^1 for producing the second or longitudinal fold 2 in the article being folded, reference may be made to the partial plan view Fig. 2^a. From this view it will be seen that the fixed blade or knife m^1 which is arranged close to the upper surface of the band a is fitted at one end to a metal strip m^2 suitably secured at each end to the framework A of the machine. Owing to the arrangement of the blade or knife m^1 after the first fold has been formed in the handkerchief or like article, it is carried along by the band a over the strip m^2 on to the upper surface of the blade m^1 and, when it occupies the position shown in the figure, the second fold is formed as hereinafter explained.

In order to actuate the frame E at the proper times there are fitted at one side thereof (see Figs. 2, 4 and 5) two brackets p to which are suitably secured horizontal bars or the like p^1 which are connected with a horizontal shaft q by means of connecting rods p^2 . The horizontal shaft q is secured to the framework A of the machine by means of brackets q^1 and it is partially rotated at the desired times from the driving shaft C of the machine through the medium of the cam or wiper q^4 fitted on the shaft F which in rotation, contacts with and depresses the horizontal oscillating lever q^2 working in a guide bracket q^5 . Curved slots n^2 are formed in the crossbars of the framework A into which project pins n^3 fitted on the frame E. Secured to the oscillating lever q^2 is a connecting rod q^3 which at its upper end is connected with a crank lever r fitted on the end of the horizontal shaft q , the arrangement being such that when the horizontal oscillating lever q^2 is depressed by the rotation of the cam or wiper q^4 the connecting rod q^3 actuates the crank lever r thereby causing the horizontal shaft q to partially rotate, the movement of the latter being communicated to the connecting rods p^2 and the horizontal bars or strips p^1 so that the frame E moves transversely and downward as shown at Fig. 5 the pins n^3 fitted in the frame E traveling in the slots n^2 formed in the crossbars of the framework A thereby carrying the movable blade m below the fixed blade m^1 for the purpose of forming the second or longitudinal fold 2 in the handkerchief or like article (Fig. 9). When the second fold is thus formed the frame E returns to its original position under the action of the springs or their equivalent s and as shown clearly at Fig.

2^a the further forward movement of the band a carries the now completely folded handkerchief clear of the blade m^1 toward the pressing roller t .

5 The distance between the blade m and the fixed blade m^1 can be altered when required to allow of the size of the fold formed by the blades being varied. The means for doing this is clearly shown at 10 Figs. 2^a, 6, 7 and 8 with reference to the frame E and the same means would also be adopted for manipulating the blade m in the frame D. As shown the blade m is fitted to a suitably shaped cross bar m^4 provided with side pieces m^5 so as to be capable 15 of a sliding movement in the frame E. The side pieces m^5 are each made with a slot m^6 through which passes a locking screw m^7 screwed into the frame E. By slackening 20 the locking screws m^7 the cross bar m^4 and blade m can be moved toward or away from the fixed blade m^1 in accordance with the size of fold required.

The diagrammatic views Figs. 6, 7 and 8 25 clearly show the various stages in the formation of a fold. Fig. 6 shows the handkerchief or like article, represented by the dotted line, being carried forward by the traveling band a over the fixed blade m^1 . Fig. 30 7 shows the frame D moved down and the moving blade m carried below the fixed blade m^1 taking the handkerchief or like article with it and forming the fold therein. Fig. 8 shows the moving blade m withdrawn 35 and the frame D raised once more so that the traveling band a is free to carry the handkerchief or like article forward to the frame E where the second folding operation takes place in similar manner.

40 The pressing or smoothing rollers l fitted in the frames D and E assist in keeping flat the article being folded and after both folds are made the traveling band carries the folded article to the back end of the machine where it passes under another pressing 45 roller t from whence it passes off the band a on to the second endless band a^1 .

The endless band a^1 is actuated by means of the gear wheel f^1 and chain or other suitable gearing e through the medium of the 50 wheel d and connecting rod g and is constantly moved back and forward when the machine is in operation, while, owing to the wheel f being of the well known "free-wheel" type, as already explained, the band 55 a has a continuous intermittent movement in the direction indicated by the arrows Figs. 1 and 3.

When the folded article, as already stated, 60 passes under the pressing roller t and reaches the second band a^1 it is carried by this band under the smoothing device u which may be in the form of a hollow polished metal receptacle or casing heated to the desired tem-

perature by steam, hot water, gas, electricity 65 or other suitable means. The smoothing device u is suitably secured to the framework A of the machine by means of lugs or the like u^1 .

After passing under the smoothing device 70 u , the arrangement of the gearing being such that the traveling band a^1 then moves in the opposite direction, the folded and smoothed article is once more brought back to the end of the machine where it drops on 75 to a suitable receiving device fitted below the band of the machine.

The receiving device preferably consists of a flexible support in the form of a strip of canvas or other fabric v which is secured 80 at one end to the traveling band a^1 and is kept at the desired distance therefrom by means of a roller v^1 , the other end being secured to a spring roller device v^2 working in the same manner as the well known type 85 of window blind spring roller on which it is automatically rolled or wound and unrolled therefrom at the proper times, by the reciprocating movement of the band a^1 , so that the necessary tension is always maintained. 90 The spring roller device v^2 is mounted in arms or supports v^3 secured to the framework A of the machine.

If desired, the smoothing device u may be arranged in line with the upper surface of 95 the traveling band a as illustrated at Fig. 10; the endless traveling band a^1 in this case being fitted above the smoothing device and the articles, after being folded and smoothed, pass into a suitable receptacle z . If de- 100 sired, a second smoothing device u^2 may also be fitted near the front end of the machine above the band a for the purpose of smoothing the articles before they pass through the folding mechanism. 105

The action of the machine while in operation is briefly, as follows:—The handkerchiefs or other articles to be folded are placed at the proper intervals on the traveling band a at the front end of the machine 110 from whence each article is carried over the fixed blade m^1 of the frame D. Owing to the arrangement of the gearing, the traveling band a then stops in its forward movement sufficiently long to allow of the first 115 fold being made as already described, the band then resumes its forward movement and again stops sufficiently long to allow of the second fold being made, whereupon the band once more moves forward and carries 120 the folded article to the back end of the machine where it passes under the pressing roller t to the second traveling band a^1 which carries it under the smoothing device and thereafter returns it to the end of the ma- 125 chine where it drops on to the receiving device. The finished articles may be allowed to accumulate on the receiving device and

they can be removed therefrom by the attendant as desired.

With a machine such as described different sizes of articles can be folded and the size of the fold can be readily varied by simply varying the position of the blade or knife *m*.

Having now fully described my invention what I claim and desire to secure by Letters Patent is:—

1. A machine for folding handkerchiefs and like articles comprising, in combination, a framework, endless traveling bands fitted in the framework, fixed blades arranged longitudinally and transversely of the bands and secured in the framework, movable frames provided with longitudinal and transverse blades and means for actuating the movable frames and blades so that they are caused to pass under the fixed blades at the proper times for the purpose of forming a "box-fold" in the article.

2. A machine for folding handkerchiefs and like articles comprising, in combination, a framework, an intermittently actuated endless traveling band fitted in the framework, fixed blades arranged longitudinally and transversely of the band and secured in the framework, movable frames provided with adjustable longitudinal and transverse blades, a second traveling band arranged below the first traveling band and actuated in conjunction with the first traveling band, means for actuating the bands, means for actuating the movable blades and means for smoothing the article being operated on.

3. A machine for folding handkerchiefs and like articles comprising, in combination, a framework, an intermittently actuated endless traveling band fitted in the framework, fixed blades arranged longitudinally and transversely of the band and secured in the framework, movable frames provided with longitudinal and transverse blades, means for altering the distance between the fixed blades and the movable blades, a second traveling band arranged below the first traveling band and actuated in conjunction with the first traveling band, means for actuating the bands comprising gear wheels, connecting rod, partial rotating driving wheel, driving chain and toothed wheels actuated by driving chain, means for actuating the movable blades and means for smoothing the article being operated on.

4. A machine for holding handkerchiefs and like articles, comprising, in combination, a framework, intermittently actuated endless traveling bands fitted in the framework, and folding mechanism, means for actuating the bands, said folding mechanism comprising fixed blades or knives secured to the machine framework, two movable frames carrying blades adjustably secured

to and working with the movable frames, oscillating lever mechanism for giving the required movement at the desired times to the frames and blades, and means for actuating said oscillating mechanism.

5. A machine for folding handkerchiefs and like articles comprising, in combination, endless traveling bands, fixed and movable blades, means for actuating the bands and the movable blades at the proper times, means for altering the distance between the fixed blades and the movable blades, means for smoothing the article and flexible means for receiving and supporting the articles after the folding and smoothing operations have been completed.

6. A machine for folding handkerchiefs and like articles comprising, in combination, a framework, an intermittently actuated endless traveling band fitted in the framework, fixed blades arranged longitudinally and transversely of the band and secured in the framework, movable frames provided with longitudinal and transverse blades, a second traveling band actuated in conjunction with the first traveling band, means for actuating the bands, means for actuating the movable blades, a smoothing device fitted between the traveling bands and means for heating the same.

7. A machine for folding handkerchiefs and like articles comprising, in combination, endless traveling bands, fixed and movable blades, means for actuating the bands and the movable blades at the proper times, means for smoothing the article and means for receiving and supporting the articles after the folding and smoothing operations have been completed comprising a flexible and extensible support fastened at one end to one of the traveling bands and at the other end to a spring roller device.

8. A machine for folding handkerchiefs and like articles comprising, in combination, a framework, endless traveling bands fitted in the framework, means for actuating the bands, fixed blades arranged longitudinally and transversely of the bands and secured in the framework, movable frames provided with longitudinal and transverse blades, means for adjusting the blades in the movable frames comprising cross-bars having slotted side pieces and locking screws, pressure rollers fitted in the frames and means for actuating the movable frames and blades so that they are caused to pass under the fixed blades at the proper times for the purpose of forming a "box-fold" in the article.

9. A machine for folding handkerchiefs and like articles comprising, in combination, a framework, an intermittently actuated endless traveling band fitted in the framework, fixed blades arranged longitudinally and transversely of the band and secured in

the framework, movable frames provided with adjustable longitudinal and transverse blades, a second traveling band actuated in conjunction with the first traveling band, 5 means for actuating the bands, means for actuating the movable blades and a smoothing device arranged in line with the upper surface of one of the traveling bands for

smoothing the articles before they pass to the folding mechanism.

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

10

ROBERT CUNNINGHAM.

Witnesses:

WILLIAM FLEMING,
JOHN P. DAWSON.