No. 629,892. Patented Aug. 1, 1899.

H. DONNER.

KNITTING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

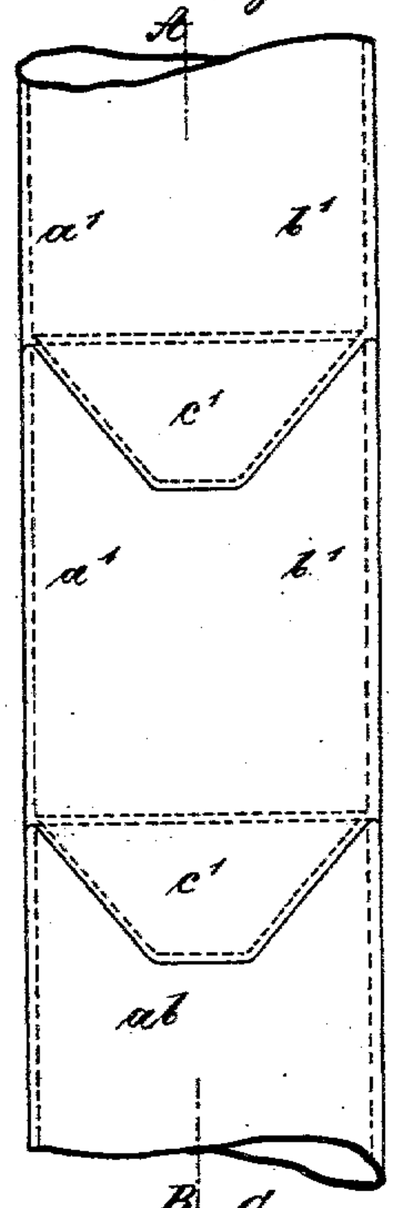


Fig. 2.

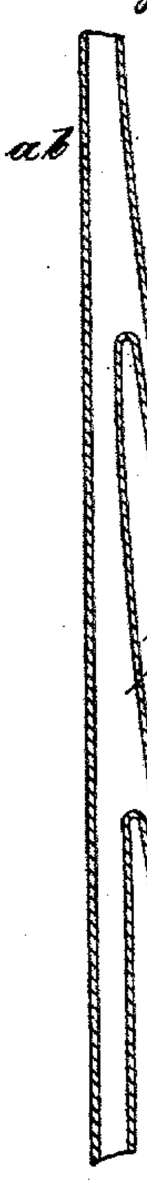


Fig. 3.

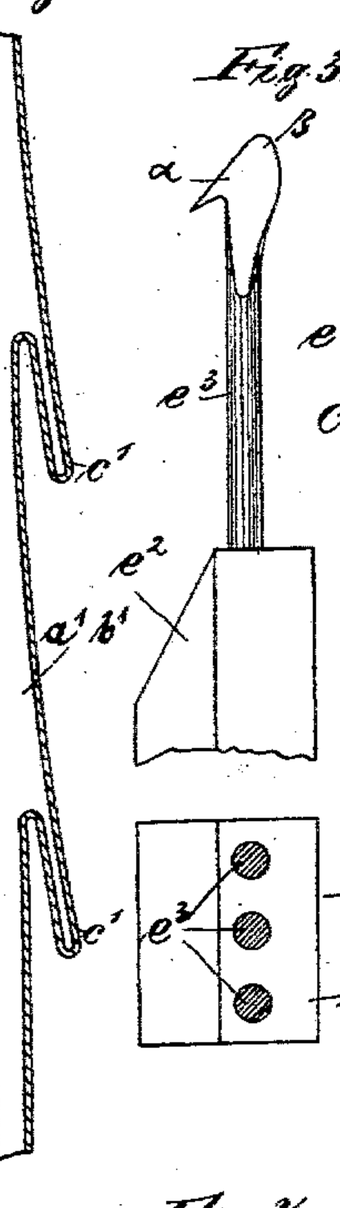


Fig. 4.

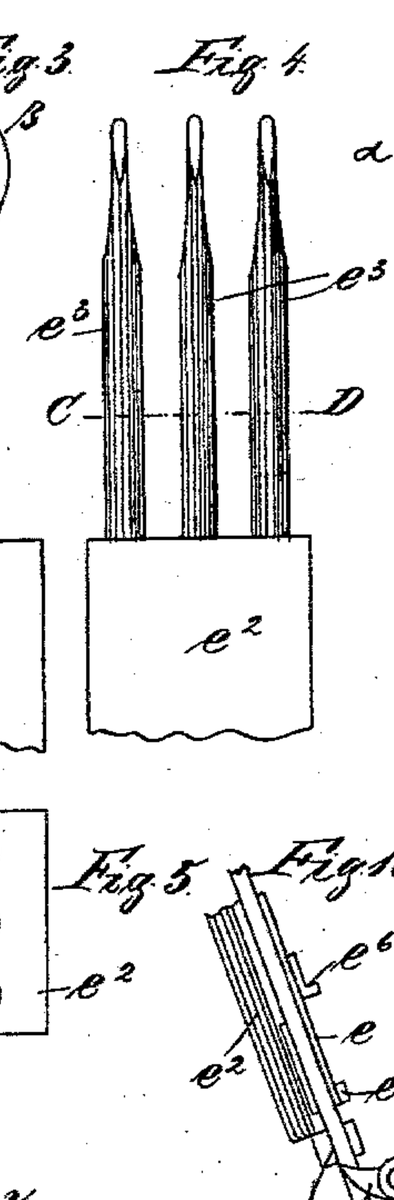


Fig. 21.

Fig. 22.

Fig. 5.

Fig. 16.

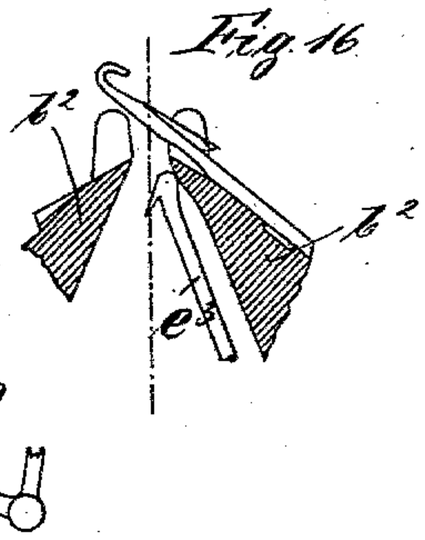


Fig. 10.

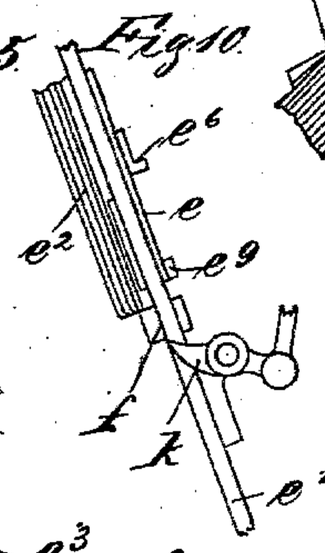


Fig. 6.

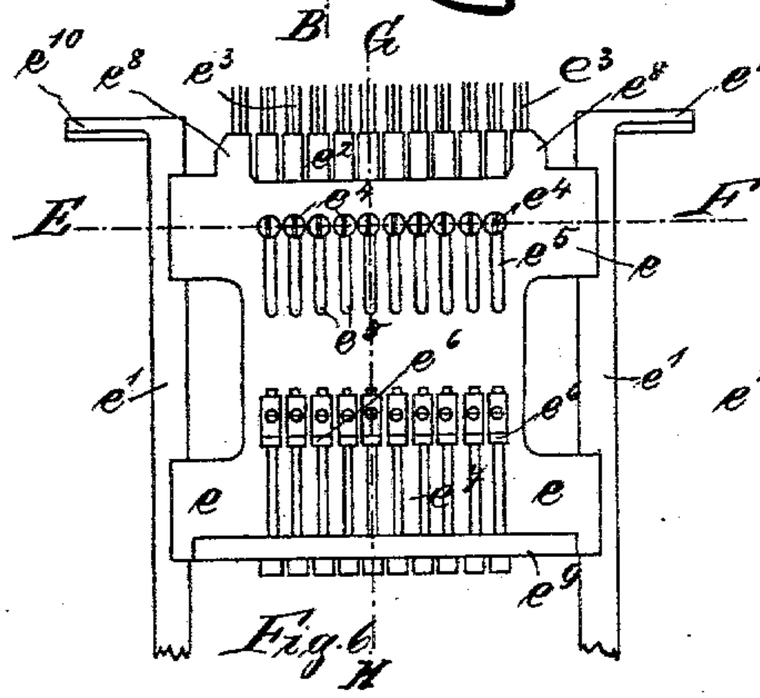


Fig. 7.

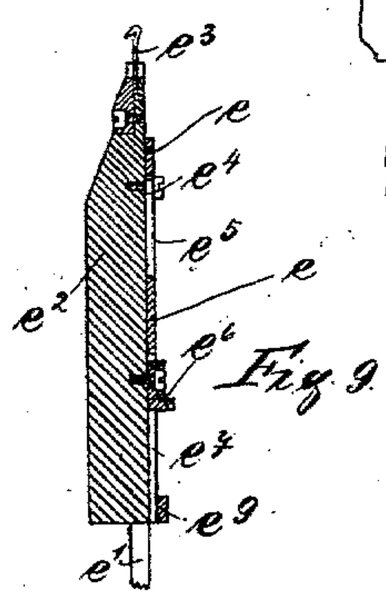


Fig. 15.

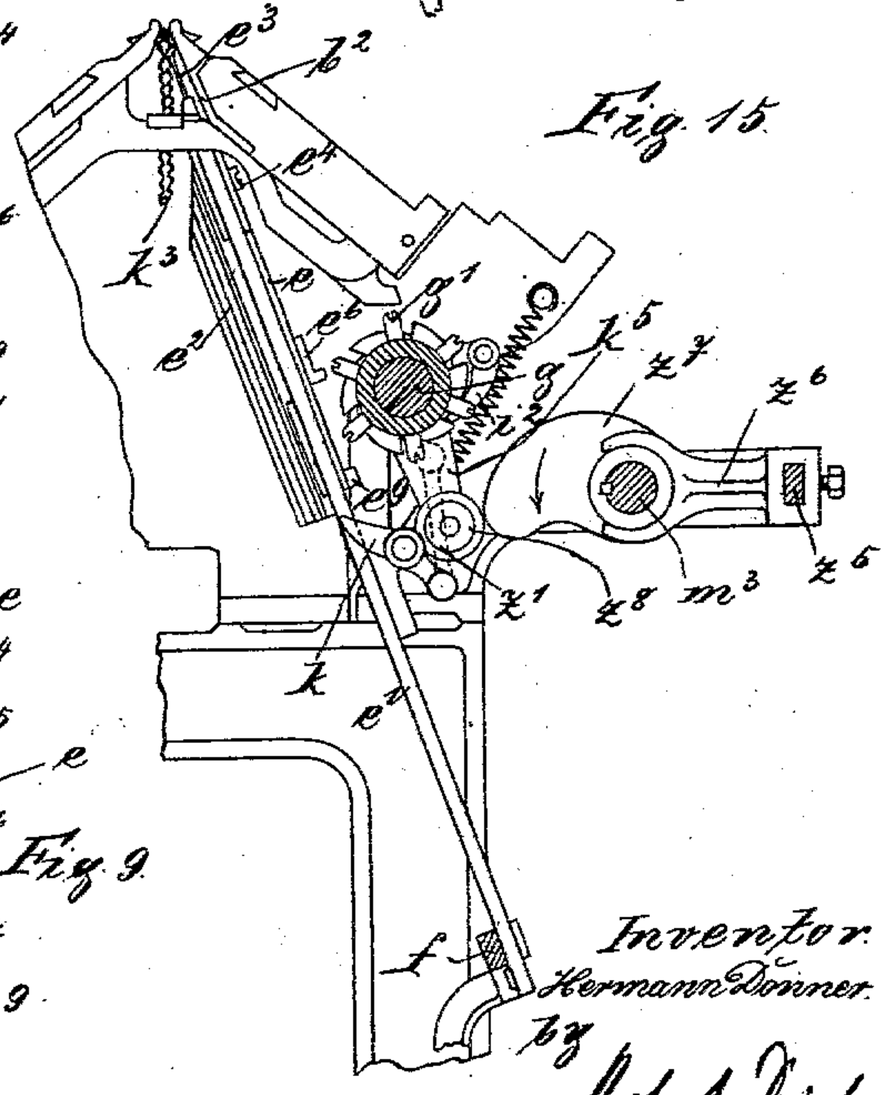
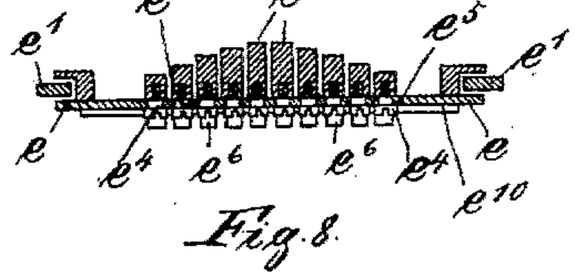


Fig. 8.



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No. 629,892.

Patented Aug. 1, 1899.

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KNITTING MACHINE.

(Application filed June 24, 1898.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 12.

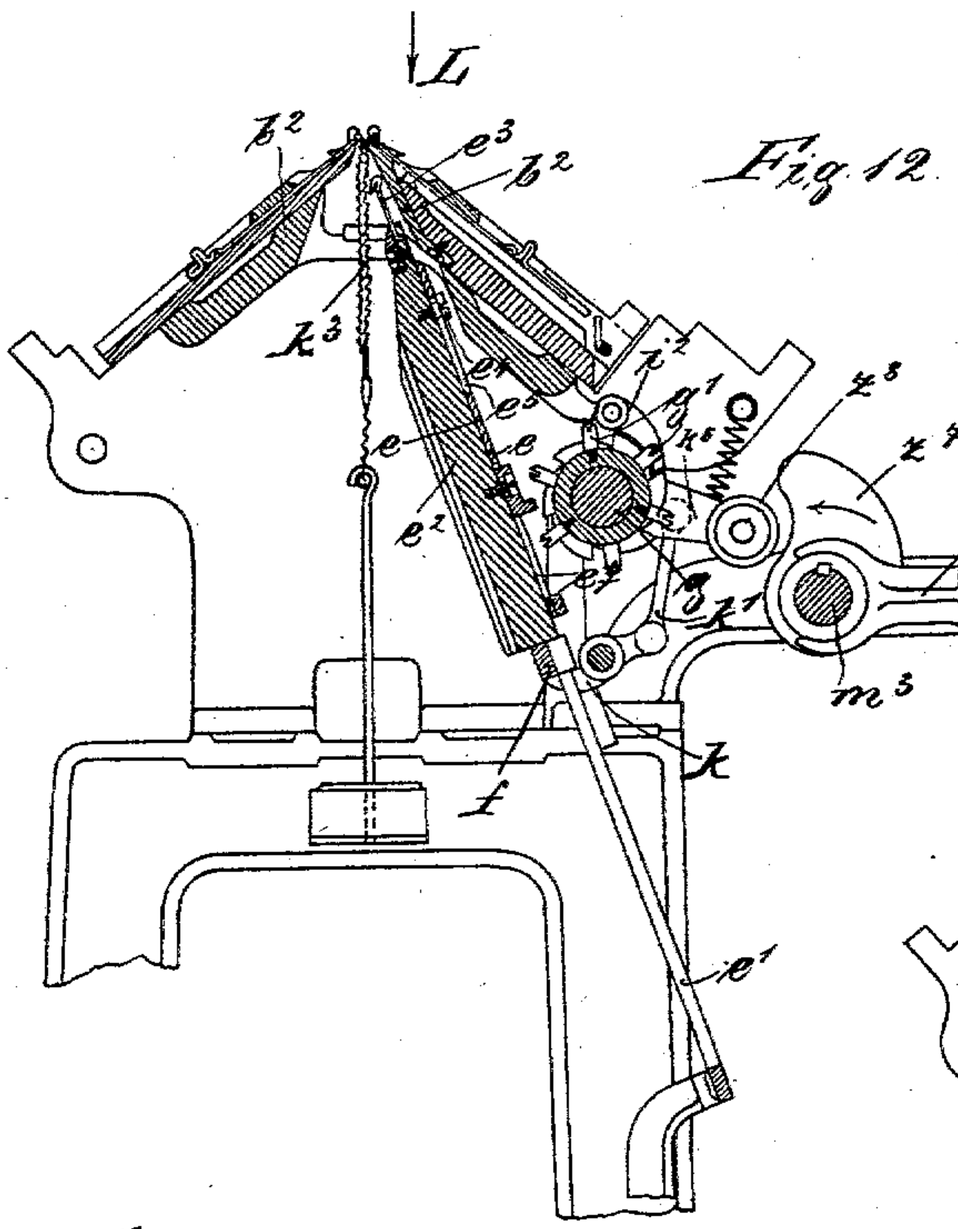


Fig. 11.

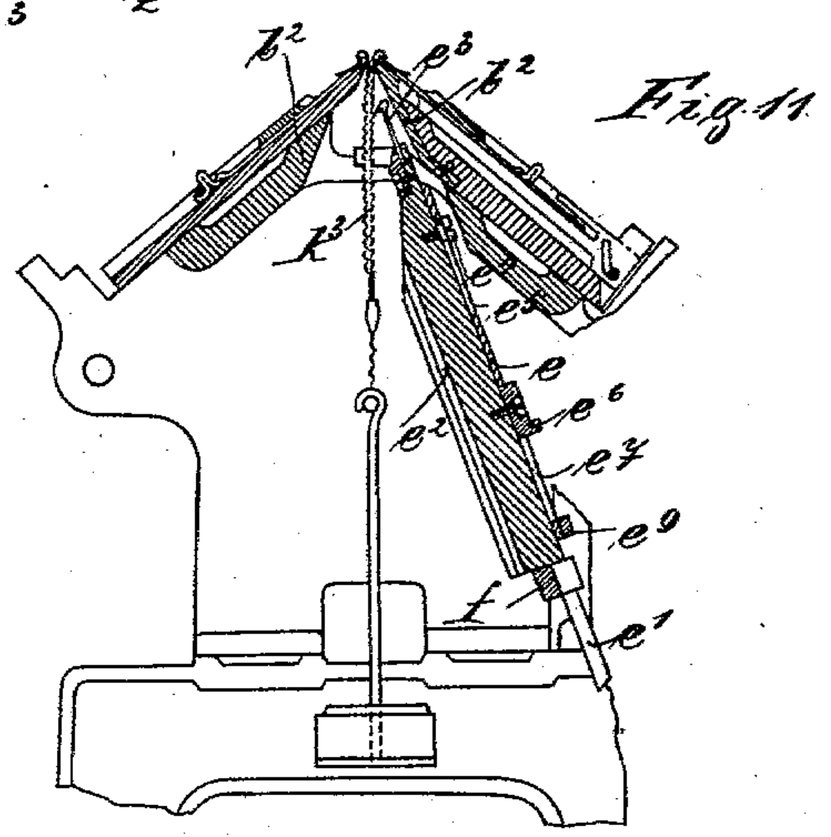
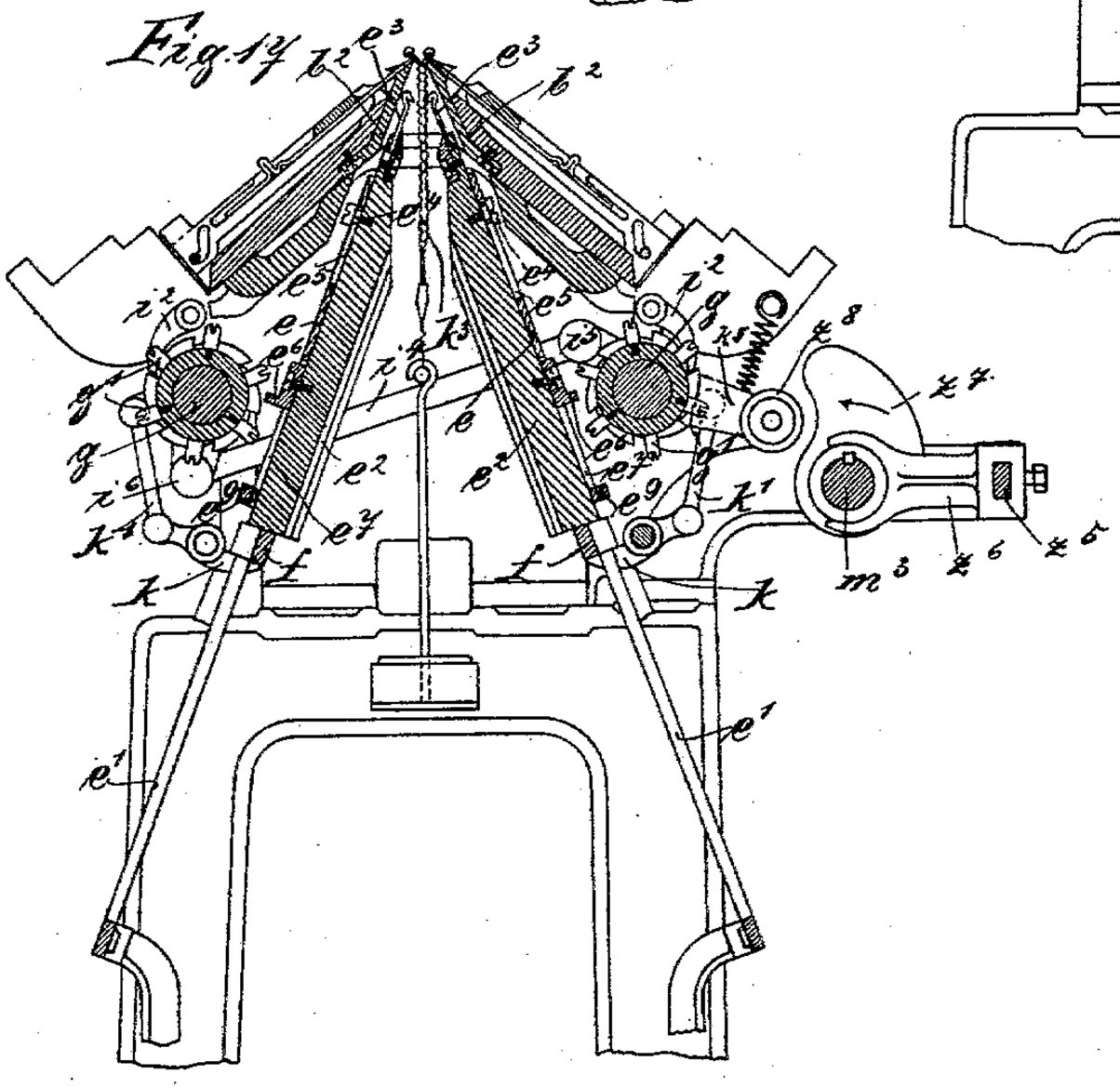


Fig. 14.



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No. 629,892. Patented Aug. 1, 1899.

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KNITTING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 13.

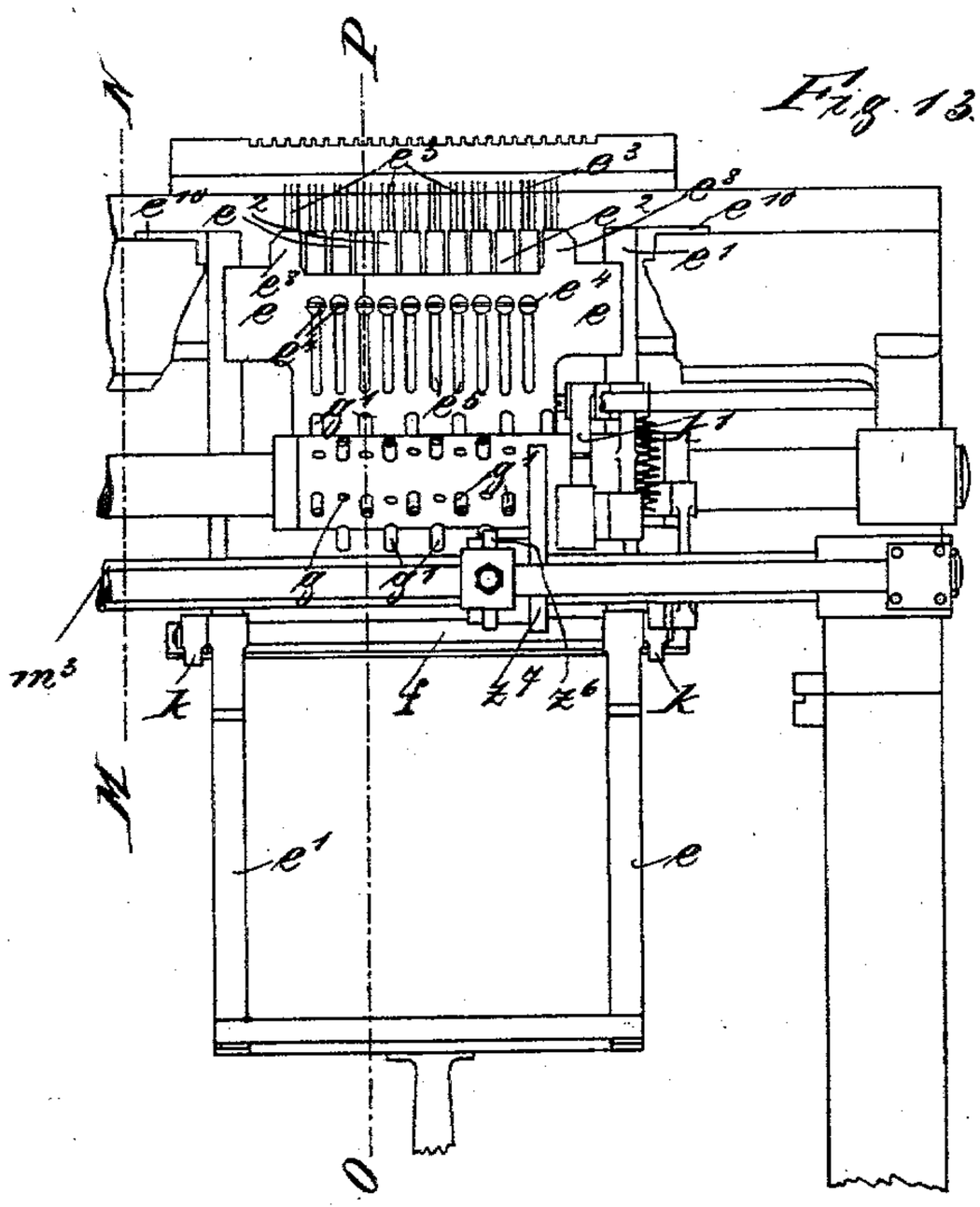
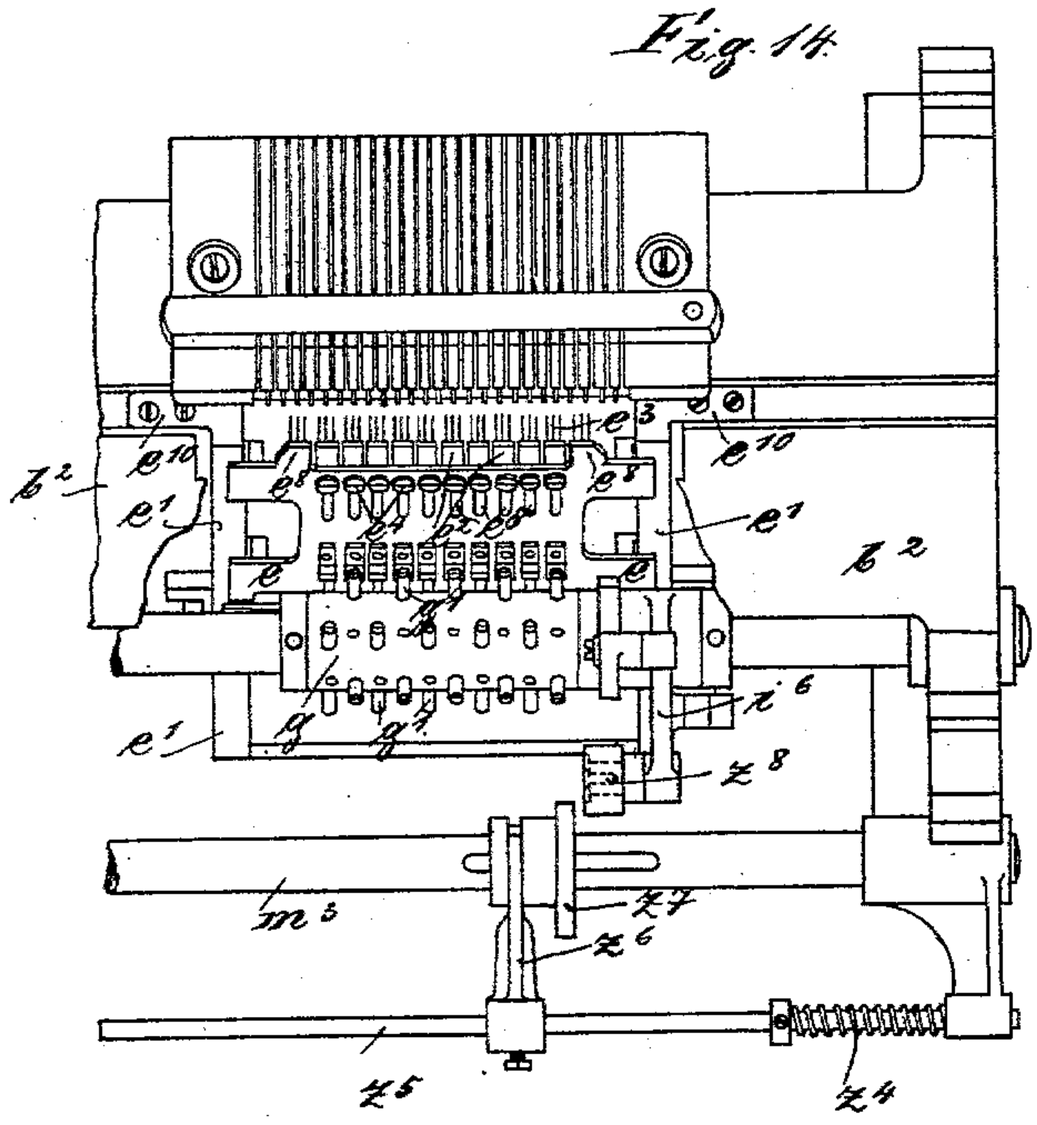


Fig. 14.



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No. 629,892. Patented Aug. 1, 1899.

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KNITTING MACHINE.

(Application filed June 24, 1898.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 19

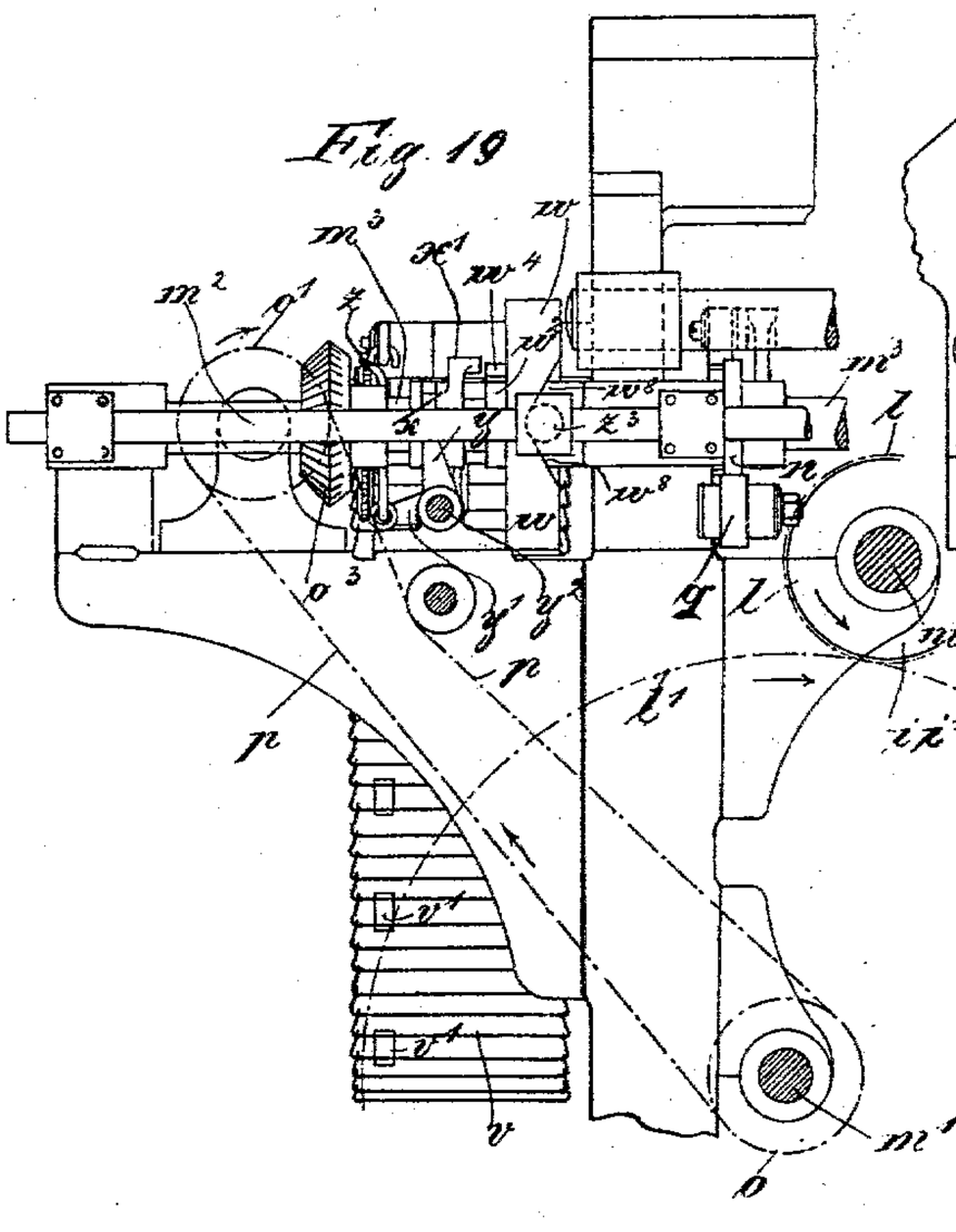


Fig. 20

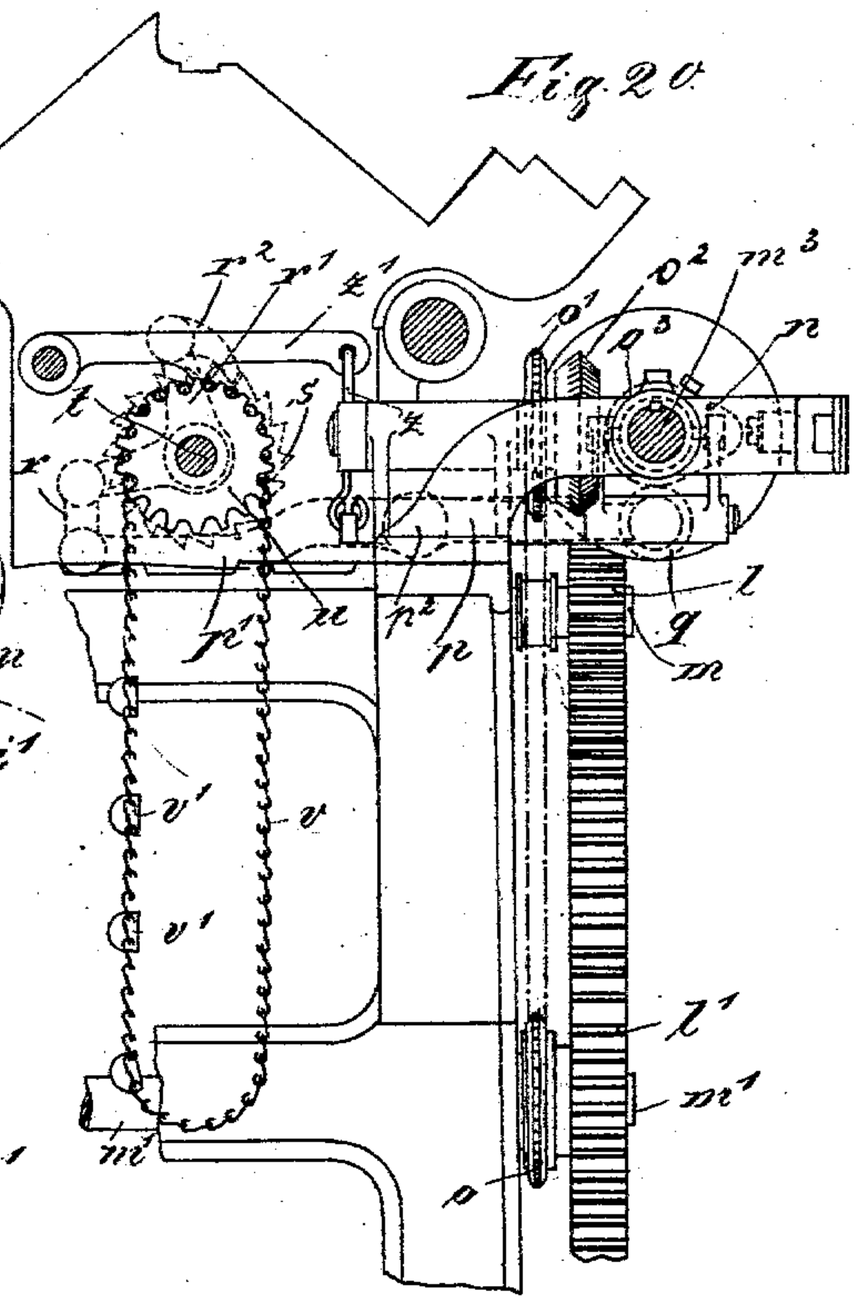
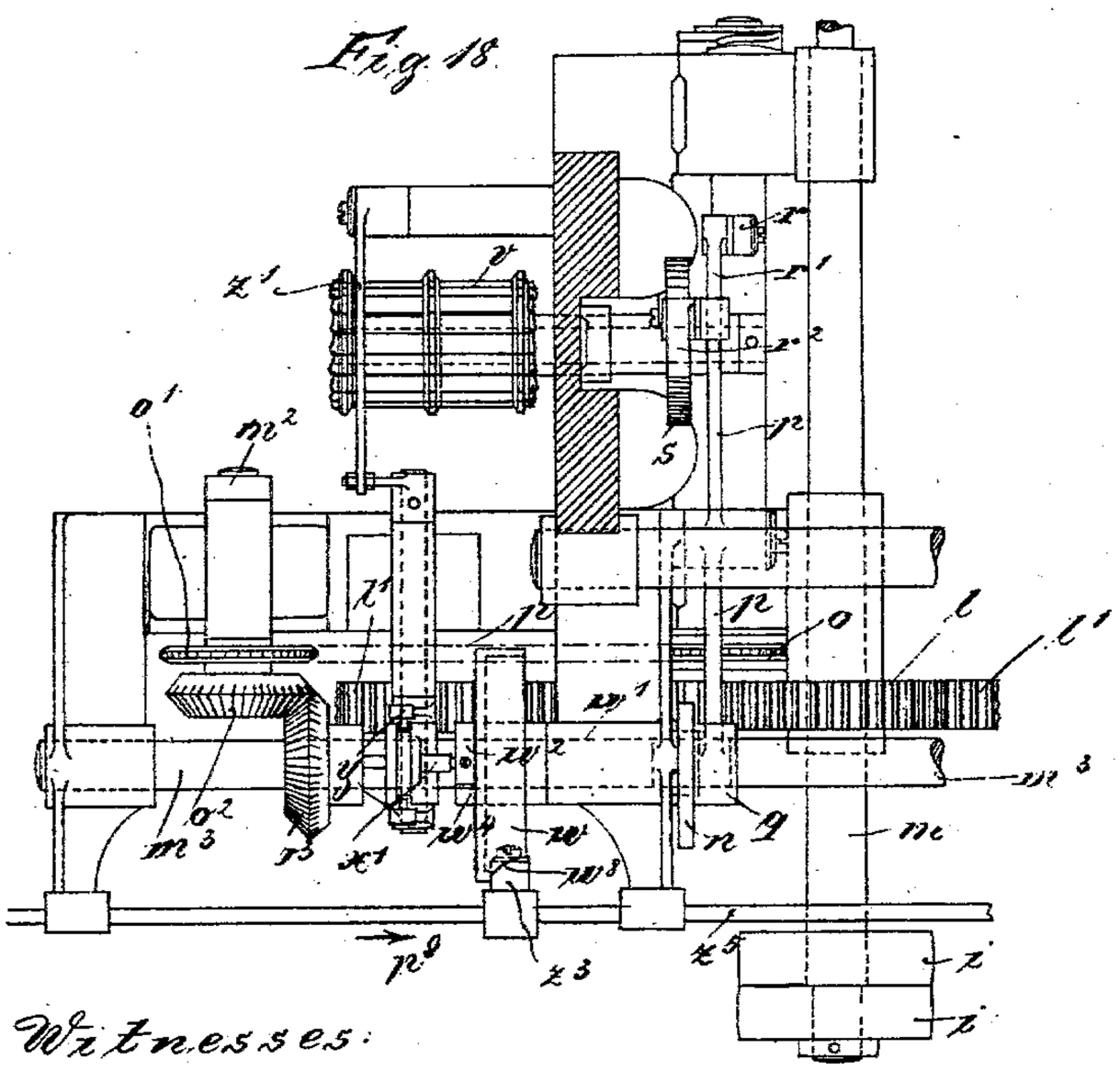


Fig. 18.



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UNITED STATES PATENT OFFICE.

HERMANN DONNER, OF CHEMNITZ, GERMANY.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 629,892, dated August 1, 1899.

Application filed June 24, 1898. Serial No. 684,410. (No model.)

To all whom it may concern:

Be it known that I, HERMANN DONNER, a subject of the King of Saxony, and a resident of Chemnitz, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Knitting-Machines, (for which a patent was applied for in Germany on the 25th day of April, 1898,) of which the following is an exact specification.

The improvements described hereinafter and shown in the accompanying drawings relate to a self-acting pulling-off arrangement for Lamb's knitting-machines, and their purpose is to effect the pulling off or weighting of the different meshes formed in one row, the weighting of each individual mesh to be as independent as possible of the weighting of the adjacent meshes. This separate weighting or pulling off of meshes formed in one row is necessary in case irregular forms or shapes of knitting-work are to be made—as, for instance, the heel of a stocking, which can be compared to a part of a bag formed in the regular knitting-work. As is well known, such a heel or bag can only be knitted on a Lamb's knitting-machine by setting idle those knitting-needles on which the regular portion of the knitting-work is hanging, drawn downward by the usually-employed weights. The heel or bag forms an elongation in the regular knitting-work, and this elongation must be weighted or pulled off separately, and especially as it is not and cannot be effected by the usual weight suspended on the regular knitting-work, as the latter remains unaltered during the formation of said elongation or heel or bag.

The improvements consist in the new mechanisms for weighting or pulling off the meshes of the heel or bag as long as they are not under the influence of the weights attached to the regular knitting-work.

In order to make my invention more clear, I refer to the accompanying drawings, in which similar letters denote similar parts throughout the different views, and in which—

Figure 1 shows in front view a stocking or knitting-work provided with several elongations, bags, or heels c'. Fig. 2 shows a cross-section on the line A B of the knitting-ware with the bags c'. Fig. 3 represents a side view of the weight-hook e^3, with its sliding weight e^2, destined to pull off the meshes which are made during the formation of the heel or bag. Fig. 4 represents a front view of Fig. 3. Fig. 5 is a section on the line C D of Fig. 4. Fig. 6 is a front view of the frame e, bearing the sliding weights e^2, with their weight-hooks e^3, showing ten of the former arranged movable in slots of the frame e, the latter bearing on each side weight-hooks e^3, fixed to projections e^8. Every weight e^2 bears three hooks e^3. Fig. 7 is a side view of Fig. 6. Fig. 8 is a cross-section on the line E F of Fig. 6, showing the sliding weights e^2 e^2 of different weight. Fig. 9 is a cross-section on the line G H of Fig. 6. Fig. 10 is a side view of the mechanism for raising the weight-hooks. Fig. 11 represents a cross-section of the well-known Lamb's knitting-machine provided on one side with the new pulling-off device, but without the mechanisms to move and throw it into activity. Fig. 12 gives the same cross-section of the driving mechanisms for the pulling-off device. Fig. 13 shows a front view of a Lamb's knitting-machine, seen in the direction of the arrow K, Fig. 12, the needle-bed being taken away, so that the pulling-off device and its driving mechanisms may clearly be seen. Fig. 14 represents an upper view of the Lamb's knitting-machine with the improvements, seen in the direction of the arrow L, Fig. 12, the middle portion of the back needle-bed being taken away. Fig. 15 represents a cross-section on the line M N of Fig. 13, the pulling-off device being raised and thrown into action. Fig. 16 shows, in the same cross-section as Fig. 15, a part of the needle-bed with a weight-hook e^3, on an enlarged scale. Fig. 17 shows, in a cross-section on the line O P of Fig. 13, a Lamb's knitting-machine with two pulling-off devices, one underneath each needle-bed. Fig. 18 gives a plan back view of the left-hand portion of a Lamb's knitting-machine, (forming a continuation to Fig. 14, part of framing being left out,) showing the main driving-gear and the devices for racking the pattern-chain and operating automatically the pulling-off contrivance. Fig. 19 gives a front view of the same portion of the machine as represented in Fig. 18. Fig. 20 gives a side view of the same portion of the machine as represented in Fig. 18. Figs.

21 and 22 show a modified form of the weight-hook in a side and front view.

The new weight-hook e^3 has a peculiar shape, the back portion of the hook proper being enlarged and strengthened, so that a long straight point-line $\alpha\ \beta$ is gained for the purpose of preventing the upper ends from piercing the fabric when being raised. The weight-hooks e^3 are fixed in a weight e^2, (in the drawings three of such hooks are shown as fixed together in one weight e^2,) and the weights e^2 are provided with screws e^4, Fig. 9, which, working in slots e^5 of a flat frame e, hold said weights to the under side of the frame e, Figs. 6 and 7. The weights e^2 have projections e^6, which, extending through slots e^7, project on the upper side of frame e. The frame e may or may not have on its upper end two projections. In the drawings these projections are indicated and marked e^8, one on every side and each of them holding three weight-hooks e^3, exactly like the sliding weights e^2. If no such projections e^8 are provided, their function is taken over by one or more of the outside sliding weights e^2 on either side of the frame e, as hereinafter described. The frame e, with its weights and hooks, is set on rails e', which form slides on which the said frame may be moved up and down. The frame e, (with its sliding weights and weight-hooks,) resting upon the rails or bearings e', is disposed in the knitting-machine between the needle-bed b^2 and the knitting-work k^3, the points of the hooks being directed toward the knitting-work and the enlarged back parts of the hooks reaching close up to and even touching the under side of the needle-bed b^2 in immediate proximity of the sinker-comb, where the meshes of the knitting fabric are to be formed, Fig. 12. By this arrangement the hooks when moved upward slide along the knitted fabric with their long point-lines $\alpha\ \beta$, and will, as soon as they are thrown into activity, promptly catch on the meshes with their points and draw them downward by their own weight, so that in working the heel or bag new meshes may be formed by the needles which are in action, and which new meshes would otherwise not be drawn down by the ordinary weight attached to the regular knitting-work. Thus, as clearly demonstrated, the weights e^2 are additional weights for the pulling off of the meshes produced during the working of the heel or bag.

To bring frame e, with its weights e^2 and hooks e^3, into action, the following arrangement has been made: The rails or slide-bars e' are by means of flanges e^{10} attached to the under side of the needle-bed b^2, Fig. 14. Across the back of these rails e' and held onto them by clasps lies a movable bar f. This bar serves to support the frame e, with its weights, in its idle or bottom position, Figs. 13 and 15, at f', and, if the pulling-off device is to be used, to move it into its active position, as shown in Figs. 10, 11, 12, and 17. For this purpose bar f is lifted by hand and raised over the movable tappet k, which turns inward to allow the bar to pass under it. As soon as it has passed, tappet k turns back again and now grasps under the cross-bar f. Tappet k can make an oscillating movement upward and downward, as afterward to be described, and when moved upward it lifts the cross-bar f, together with the frame e and its sliding weights e^2, these being in their highest position in frame e, until all the hooks e^3 have reached their highest position close to the needle-bed, Figs. 15 and 16. Here they catch in the fabric as soon as they, with the frame e, are released from cross-bar f, Figs. 10 and 15. This releasing takes place as soon as the tappet k is turned upward, as later on to be described. Then the cross-bar f drops again to its rest, Fig. 15. Now frame e, with its sliding weights e^2, hangs suspended on the fabric, drawing it downward.

In case frame e be provided with projections e^8 the hooks e^3, which are fixed therein, remain hanging onto those meshes in which they caught at first, thus holding up frame e in its active position during the formation of the heel or bag, as by the needles above these hooks not any or but little new fabric is formed, these parts being the extreme edges of the heel. The hooks e^3, attached to the sliding weights e^2, sink down gradually and in proportion to the fabric produced above them until they are pushed up again by the studs g' of the rotating stud-wheel g coming into contact with and lifting upward the projections e^6 of the weights e^2, Figs. 12, 15, and 17. If, on the other hand, frame e has no projections e^8, provided with hooks e^3, it is held in active position by one or more of the outside sliding weights e^2 on either side of the same by means of hooks e^3, the studs g' of stud-wheel g being arranged so as not to engage with the projections e^6 of these sliding weights, which consequently remain hanging onto those meshes in which they caught at first. The other sliding weights of course continue to be actuated by stud-wheel g and studs g' in the manner as described. The stud-wheel g can, just as required by the nature of the fabric, be moved every time after the second, fourth, or sixth row of stitches has been formed, by which device both the raising of the weight-hooks e^3 and the pulling-off of the fabric can be regulated according to the shape of the heel or bag desired.

The arrangement chosen for actuating automatically the frame e, with its weight-hooks e^3, is as follows: On the main driving-gear of the knitting-machine i is the fast, and i' the loose, pulley, Figs. 18 and 19. The toothed wheel l, keyed onto the main shaft m, gears with spur or crank wheel l', which latter imparts to the carriage of the knitting-machine its movement to and fro in the well-known manner. (Not shown in the drawings.) One revolution of the crank-wheel l' causes the carriage to make one movement to and fro,

or, as hereinafter called, a "double course." On axis m' of the crank-wheel l' and rotating with it is fastened a chain-wheel o, which by means of a chain p is connected with a corresponding wheel o', fixed, together with bevel-wheel o^2, Fig. 18, on axis m^2. Bevel-wheel o^2 being geared with a similar wheel o^3 on cam-shaft m^3 transmits the motion of axis m' to cam-shaft m^3, which extends over the whole breadth of the machine, and therefore cam-shaft m^3 makes one revolution while crank-wheel l' has once turned upon its own axis and the carriage has made one double course. Upon cam-shaft m^3 is fixed an eccentric n, Figs. 18 and 20, which acts on the roller q of the lever p p', the axle of which is at p^2, Fig. 20. Lever p moves, by means of link r, the lever r' r' (the axle of which is at t) with pawl r^2, and thus moves the ratchet-wheel s. Ratchet-wheel s, Fig. 20, is fastened on its axis, which carries also sprocket-wheel u, with chain v, the last named being provided with adjustable studs v'. This contrivance causes, after every double course of the carriage, the sprocket-wheel u to be racked forward by one tooth of the ratchet-wheel s, so that after a certain predetermined number of courses or double courses the chain v, by means of studs v', can operate the pulling-off apparatus, as afterward to be described.

The putting in and out of action of the pulling-off device is done in the following manner: Disposed loosely upon cam-shaft m^3, Figs. 18 and 19, is a disk w, with a cavity w^8 on its side, held in position by bearing w' and collar w^2, Fig. 18, and having on the side opposite to its cavity a projection w^4, Fig. 18. Fixed on the same shaft m^3 is a clutch-wheel x, also provided with a projection x'. This clutch-wheel, which is laterally movable on shaft m^3, but is forced to turn with the shaft m^3, is governed by fork y, working in a groove in said clutch-wheel, which fork, pivoted, together with lever y', on pin y^2, is moved by means of link z, Figs. 19 and 20, as soon as its connecting-lever z' is lifted by one of the studs v' on chain v. If the said clutch-wheel x is moved by fork y in a sidewise direction toward the disk w, the projections w^4 and x of the disk w and clutch-wheel x, respectively, come in contact, and the disk w is turned in the direction of the clutch-wheel x—*i. e.*, with the axle m^3. Whenever the disk w is taken around one revolution by the projection x' of the clutch-wheel x, the roller z^3, resting in the recess w^8 of the disk w, is pushed in the direction of the arrow p^9 against spring z^4, Fig. 14, at the end of the bar z^5, and as roller z^3 is fastened to this bar z^5 it imparts to the latter the same motion. Bar z^5, moving in the direction of the arrow from left to right, Fig. 14, causes also fork z^6, which is fastened on it and which works in a groove of the eccentric z^7, to move the eccentric z^7 (arranged movably on cam-shaft m^3) in the same direction. Eccentric z^7, rotating with cam-shaft m^3, comes in contact with and acts on the roller z^8. This latter roller z^8 when pressed down by z^7 acts on the lever k^5, the link k', and lever k, Figs. 12, 15, and 17, and thus causes the lever or tappet k to be moved upward by the same movement, the stud-wheel g being racked forward one tooth by pawl i^2 in a well-known manner. This action takes place while one of the chain-studs v', Fig. 20, lifts the lever z'. At the same time the carriage of the machine has made a double course. As soon as lever z' has passed over the chain-stud v' the pulling-off device is again thrown out of action. The projection x' of the clutch-wheel x releases projection w^4 of the disk w, the bar z^5 is pushed back again in the opposite direction of the arrow p^9 by the force of spring z^4, and eccentric z^7 is pulled away again from roller z^8.

If in addition to the pulling-off device under the back needle-bed, as described, a second one is required under the front needle-bed, all that is wanted is to fix such another apparatus beneath the front needle-bed, Fig. 17. The motion is transmitted from the apparatus at the back by means of a rod i^4, fixed on the one side to lever i^6 and on the other to lever i^5.

It is clearly to be seen that the chief point of this invention consists in the arrangement of the pulling-off device in a certain manner on the knitting-machine. The mechanisms that may be chosen for catching into the meshes of the knitting-ware can be of various kinds. The machine can be provided with hooks or bent wires or other well-known mechanisms for catching and pulling off meshes of knitted goods. For that purpose in the claims a universal expression is chosen for the mechanism to catch in the meshes by the term "device for weighting the knitting-ware."

It is well known that hooks and bent wires, &c., as mechanisms for pulling off the knitted goods have already been employed; but the certain arrangement of such devices as made by me is new.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. A pulling-off apparatus for straight-knitting machines consisting in a frame e and sliding rails e', supporting-frame e, arranged on the under side of the needle-bed and between the needle-bed and the knitting-ware and bearing a device for weighting some part of the knitting-ware, comprising the sliding weights e^2 e^2 and hooks e^3 e^3 adapted to slide freely in the frame e, in combination with a rotating shaft g bearing studs for raising the sliding weights and hooks independent one from the other, for the purpose as described.

2. A pulling-off apparatus for straight-knitting machines, consisting in two frames e and sliding rails e' supporting-frame e, arranged on the under side of each one of the two opposite needle-beds and between each needle-bed and the knitting-ware and each

frame bearing a device for weighting the knitting-ware, comprising the sliding weights e^2 e^2 and hooks e^3 e^3 adapted to slide freely on frame e, in combination with two rotating shafts g bearing studs for raising the sliding weights independent one from the other, for the purpose as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HERMANN DONNER.

Witnesses:
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MAX HUNGER.