No. 636,170. Patented Oct. 31, 1899.

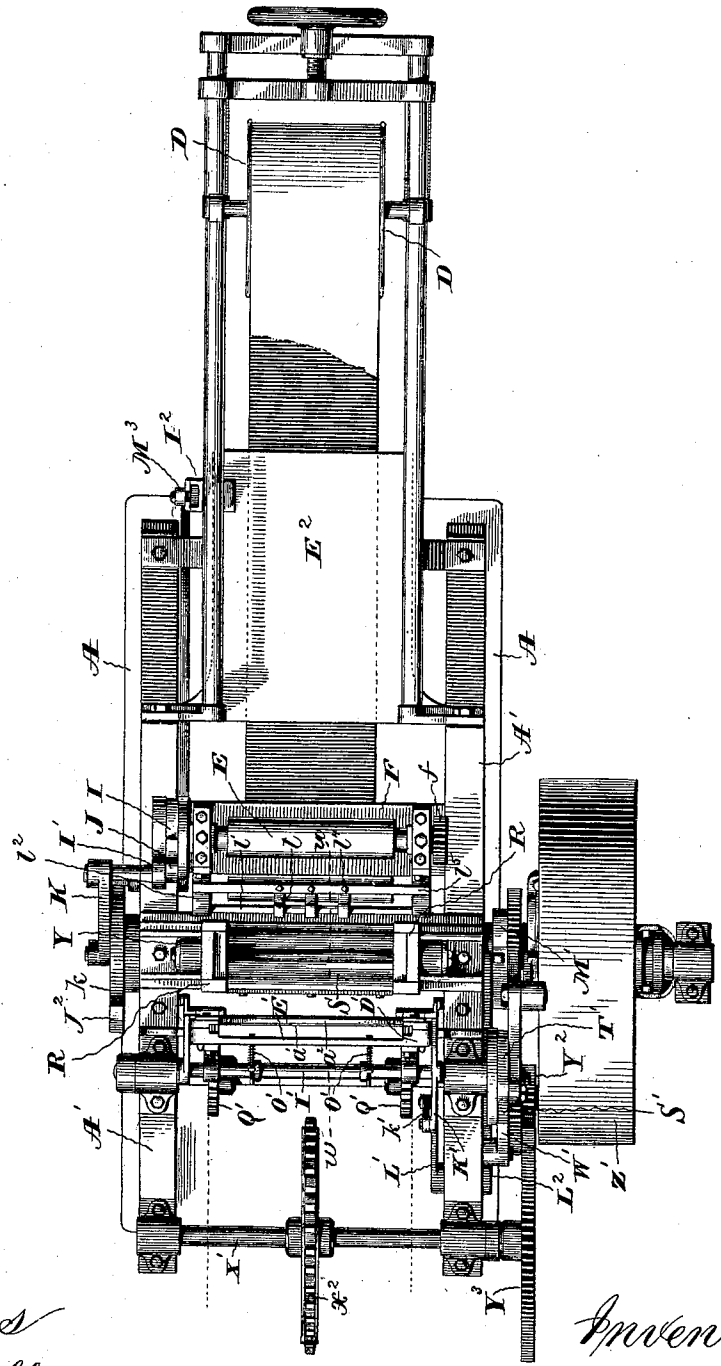
C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(No Model.) (Application filed Dec. 20, 1894.)

7 Sheets—Sheet 1.

Fig. 1.



Witnesses
Chas. J. Williamson.
Jas. L. Hutchinson.

Inventors
Chas. H. Palmer and Jno. W. Denmead
by Prindle and Russell, their Attys

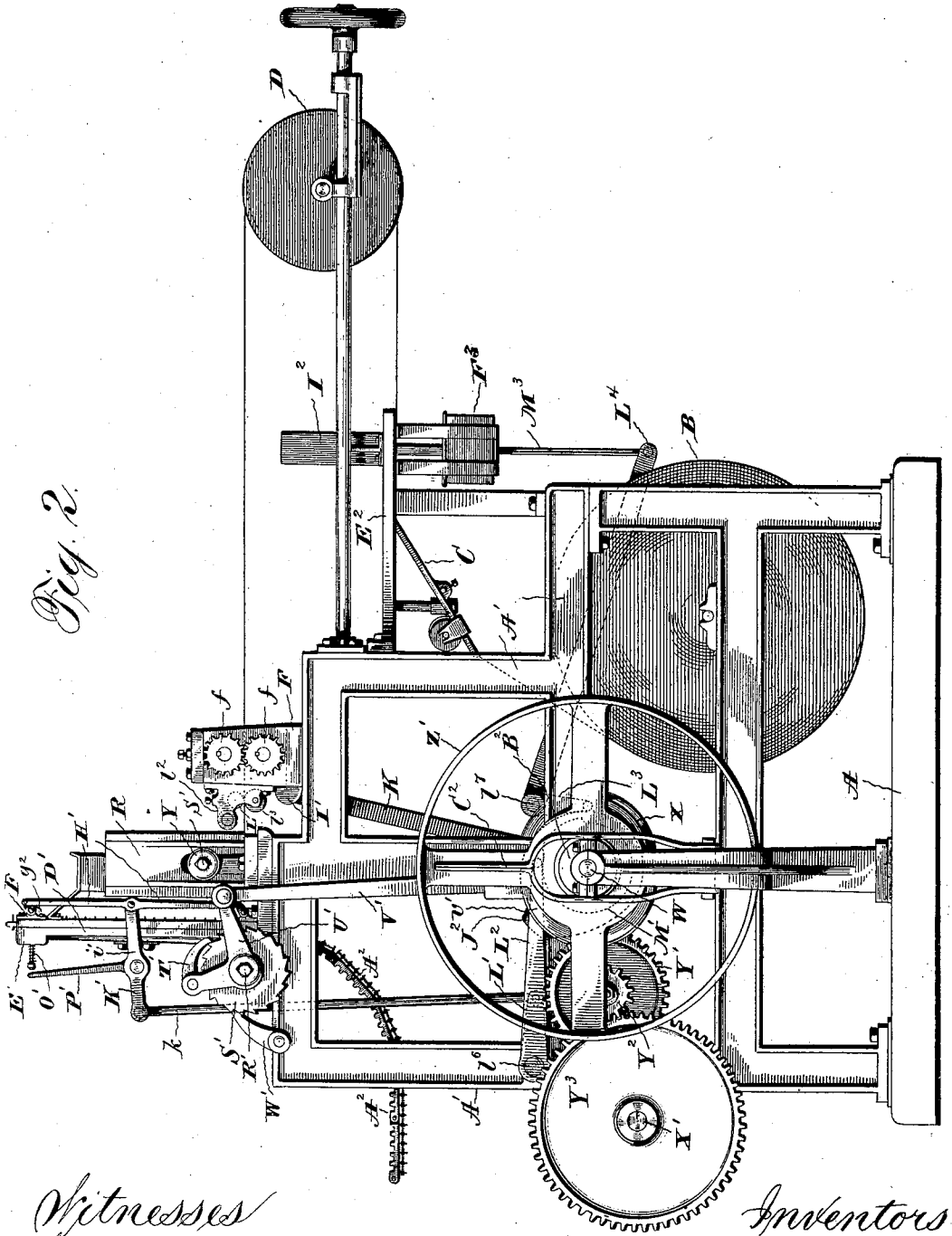
No. 636,170. Patented Oct. 31, 1899.

C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(No Model.) (Application filed Dec. 20, 1894.) 7 Sheets—Sheet 2.

Fig. 2.



Witnesses
Chas. J. Williamson.
Jas. E. Hutchinson.

Inventors
Chas. H. Palmer and Jas. W. Denmead,
by Brindley and Russell, their Attys.

No. 636,170. Patented Oct. 31, 1899.

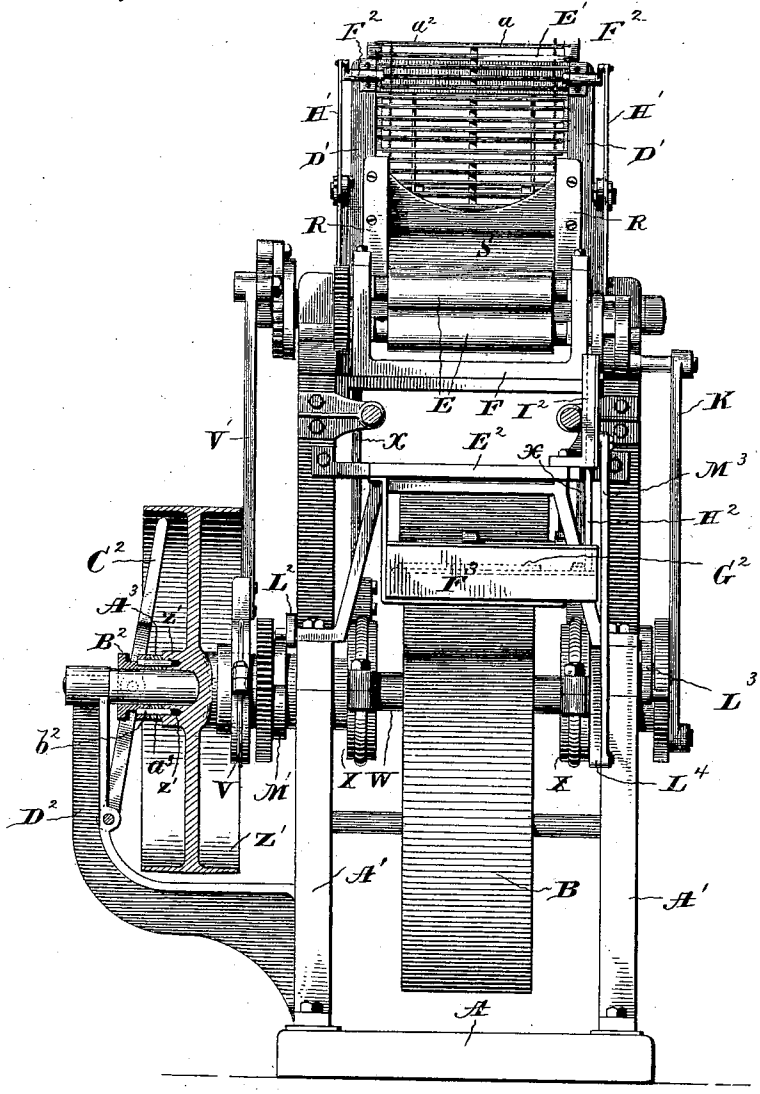
C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(No Model.) (Application filed Dec. 20, 1894.)

7 Sheets—Sheet 3.

Fig. 3.



Witnesses
Chas. J. Williamson.
Jas. E. Hutchinson.

Inventors
Chas. H. Palmer and Jno. W. Denmead, by
Brindle and Russell, their attys.

No. 636,170. Patented Oct. 31, 1899.

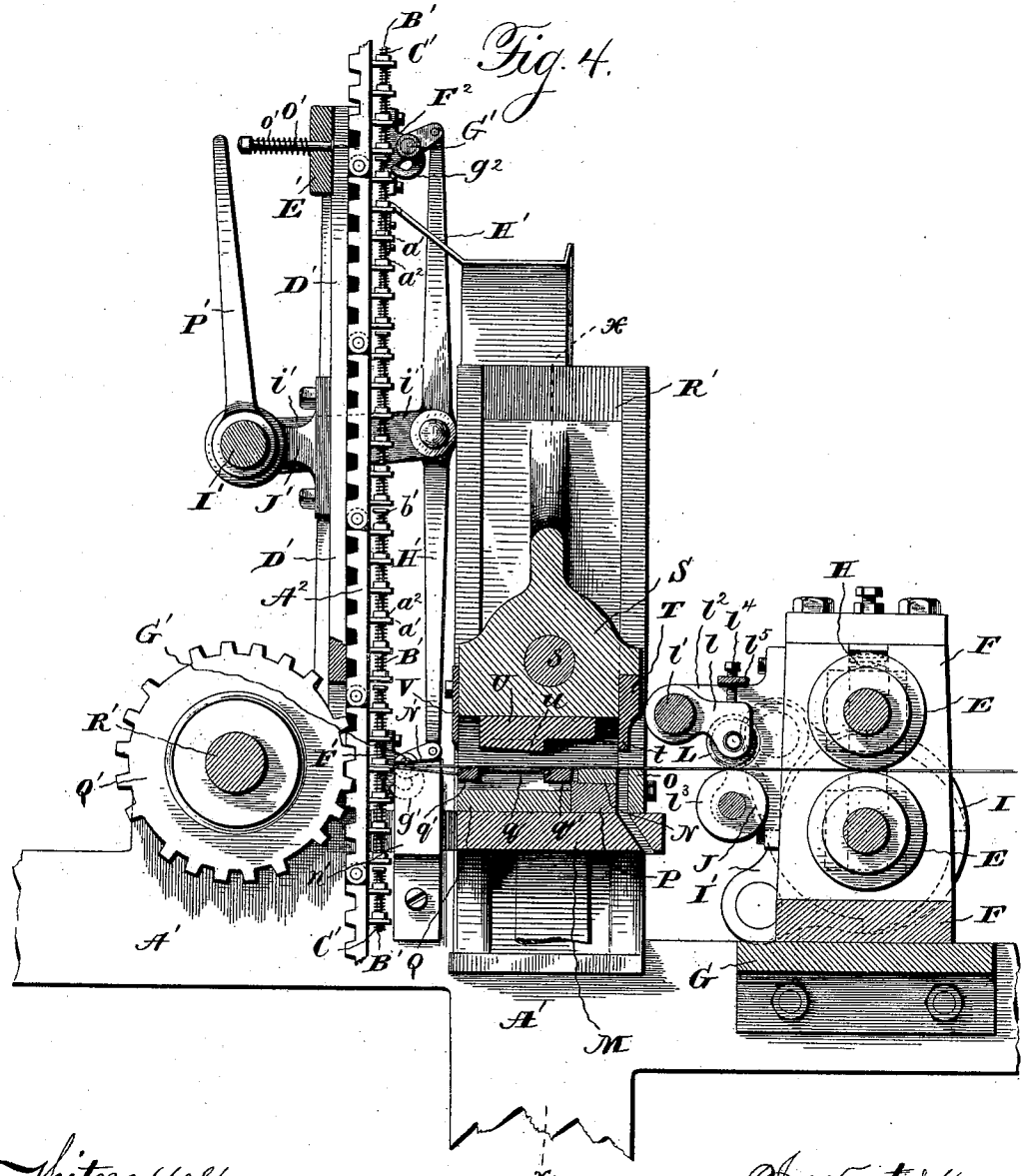
C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(No Model.) (Application filed Dec. 20 1894.)

7 Sheets—Sheet 4.

Fig. 4.



Witnesses:
Jas. E. Hutchinson.
Chas. J. Williamson.

Inventors:
Chas. H. Palmer and Jas. W. Denmead, by
Bindley and Russell, their Attys.

No. 636,170. Patented Oct. 31, 1899.

C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(Application filed Dec. 20, 1894.)

(No Model.) 7 Sheets—Sheet 5.

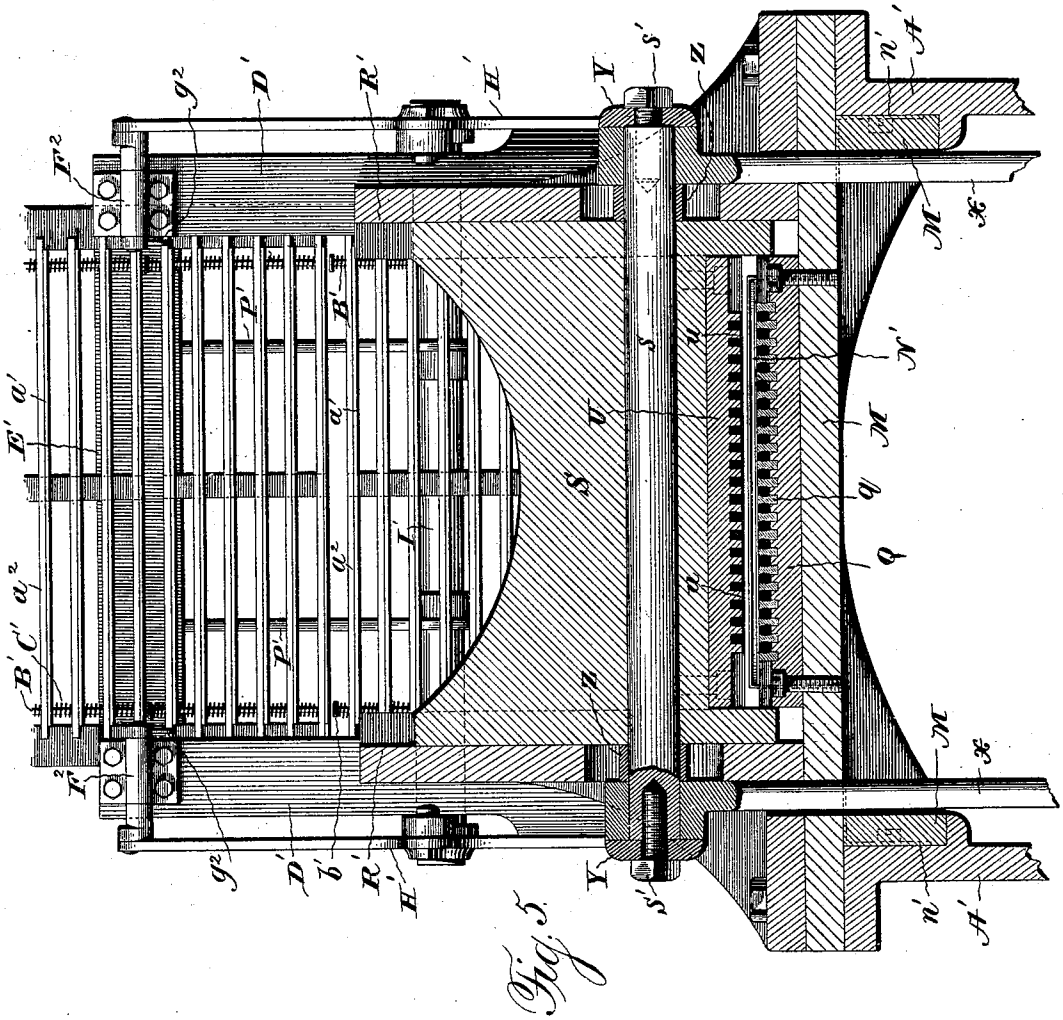


Fig. 5.

Witnesses:
Jas. E. Hutchinson
Chas. J. Williamson.

Inventors.
Chas. H. Palmer and Jno. W. Denmead, by
Prindle and Russell, their Attys

No. 636,170. Patented Oct. 31, 1899.

C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(Application filed Dec. 20, 1894.)

(No Model.) 7 Sheets—Sheet 6.

Fig. 6.

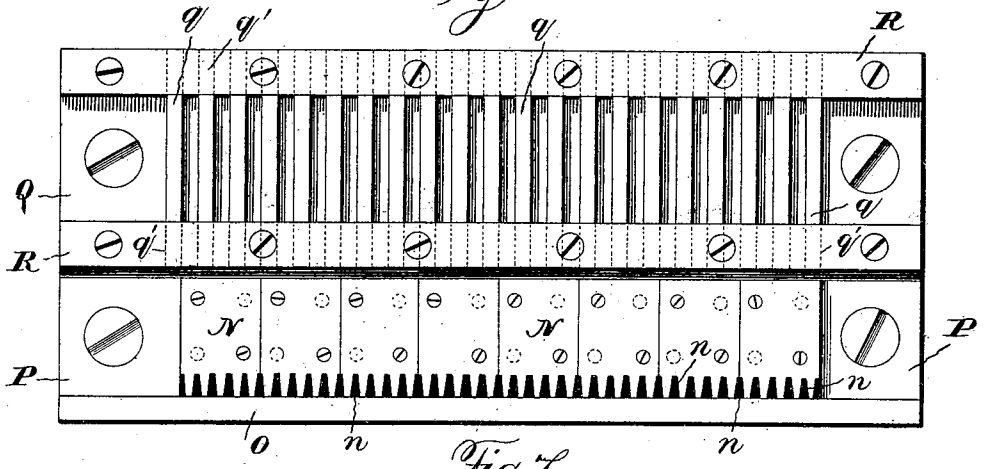
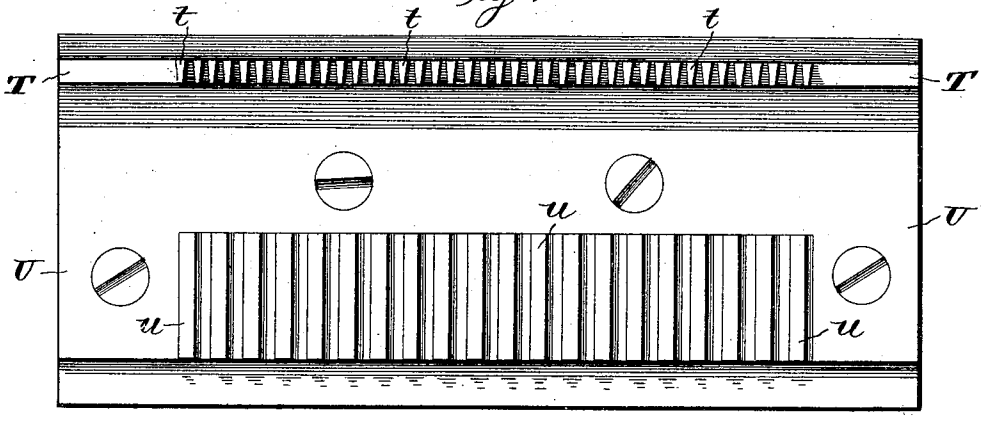


Fig. 7.



Witnesses:

Jas. E. Hutchinson.

Chas. J. Williamson.

Inventors.

Chas. H. Palmer and Jas. W. Denmead, by

Prindle and Russell, their Attys.

No. 636,170. Patented Oct. 31, 1899.

C. H. PALMER & J. W. DENMEAD.

MATCH MAKING MACHINE.

(Application filed Dec. 20, 1894.)

(No Model.) 7 Sheets—Sheet 7.

Fig. 8.

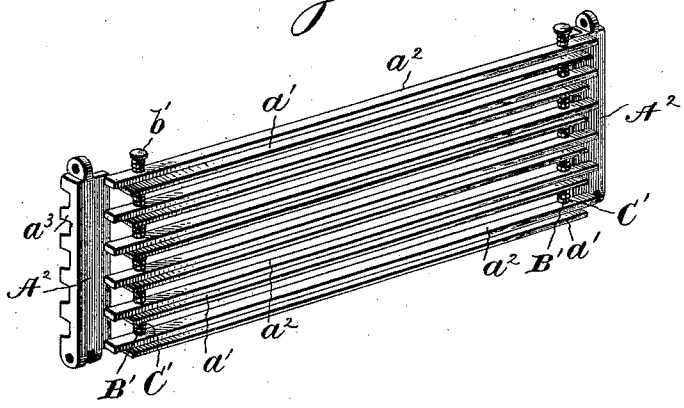
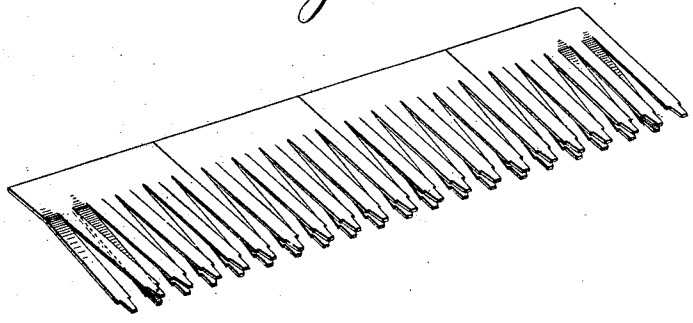


Fig. 9.



Witnesses:
Jas. E. Hutchinson.
Chas. J. Williamson.

Inventors.
Chas. H. Palmer and Jas. W. Denmead by
Crindle and Russell, their Attys

UNITED STATES PATENT OFFICE.

CHARLES H. PALMER AND JOHN W. DENMEAD, OF AKRON, OHIO, ASSIGNORS TO THE DIAMOND MATCH COMPANY, OF CHICAGO, ILLINOIS.

MATCH-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 636,170, dated October 31, 1899.

Application filed December 20, 1894. Serial No. 532,479. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. PALMER and JOHN W. DENMEAD, of Akron, in the county of Summit, and in the State of Ohio, have invented certain new and useful Improvements in Methods of and Machines for Making Matches; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of our machine. Fig. 2 is a side elevation thereof. Fig. 3 is a front elevation of said device, the band or driving wheel being shown in section. Fig. 4 is a vertical section through the punching and clamp-opening mechanism on the line *w w*, Fig. 1. Fig. 5 is a section on line *x x* of Fig. 4. Fig. 6 is a plan view of the dies. Fig. 7 is a like view of the under sides of the punches. Fig. 8 is a perspective view of a portion of the chain-carrier, and Fig. 9 is a perspective view of a portion of a card of matches.

Letters of like name and kind refer to like parts in each of the figures.

The object of our invention is to enable paper matches to be rapidly and cheaply manufactured; and to this end said invention consists in the method employed and the machine having the construction and combination of parts substantially as hereinafter specified.

Our invention contemplates the production of cards of matches composed of a series of matches united to a common part, which may be formed into a book, and in the practice of our invention we employ a roll of strawboard or other paper from which stock is continuously drawn and fed to splint-forming devices and thence placed in carrying or conveying mechanism for the customary dipping treatment. Such carrying mechanism is in the form of an endless chain, which after the splints are formed takes them to the paraffining and composition-applying devices; but as these latter may be of any of the usual constructions—such, for instance, as are shown in the patent to Beecher and Wright, No. 528,457, of October 30, 1894—we do not deem it necessary to show or describe them, as to such mechanism our invention does not pertain.

The parts of the machine that are new with us and which are necessary to be shown and described are illustrated as mounted upon a frame composed of a base or bed-plate A, from which rise two side pieces A′ and A′. At a suitable point upon said frame bearings are provided to journal a roll of strawboard or other paper B, that is guided therefrom to the splint-forming mechanism, to be described, over an inclined guide-plate C and around a roller D, such as are employed in the box-making machine shown in Patent No. 554,975, of E. B. Beecher and J. P. Wright. From the roller D, which is made horizontally adjustable, the paper is passed to and between two feed-rollers E and E, that are journaled one above the other in boxes placed in vertical slots in the upright extensions of a frame F, which is supported upon a cross-bar G, that is bolted to the two side pieces A′ and A′. Said rollers are caused to rotate together by intermeshing gear-wheels *f* and *f* upon the ends thereof, and the upper roller is moved yieldingly toward the lower to produce the requisite driving-friction upon the paper by means of coiled springs H and H, that press upon the journal-boxes of said upper roller. Upon the end of the lower roller opposite that having the gear-wheel *f* is mounted a ratchet-wheel I, which, through the engagement of a pawl J, is adapted to intermittently rotate the rollers and at each rotation thereof feed the paper an amount sufficient for the formation of one match-card. The pawl I is pivoted to an oscillatory disk I′, which is connected by a rod or bar K with a plate *k*, that is mounted upon the main shaft of the machine, so that at each revolution of the latter the feed-rollers will be actuated to feed the paper the amount above indicated.

For a purpose to hereinafter appear the stock after leaving the feed-rollers is incised or cut in three equidistant lines by means of three circular knives or cutting-disks L and L, that are journaled each in an arm *l*, which is pivoted upon a cross rod or bar *l′*. Said bar *l′* is supported at its ends by brackets l^2 l^2, that are attached to the upright extensions of the frame F, and said brackets also journal a roller l^3, over which the paper passes and is supported for the action of the disks L and L.

A screw l^4, passing through a cross-bar l^5, likewise supported by the brackets l^2 and l^2 and engaging the upper side of the knife-carrying arm l, operates to adjust and hold the knife in position to cut to the desired extent. None of the cuts are made deep enough to pass entirely through the paper, but preferably the middle disk is adjusted to cut deeper than the others, for a reason stated hereinafter.

At a short distance from the feed-rollers are located the dies and punches for forming the match-splints, which operate first to remove V-shaped portions from the paper to form the composition or head receiving portions of the splints and then to sever the paper to produce the splints. Both sets of dies are shown as mounted upon a cross-bar M, which is secured at its ends between the side pieces A′ and A′ of the frame.

The dies for forming the head-receiving portion of the splint consist of a series of plates N and N, that are provided with V-shaped notches n and n in one edge and are secured by screws and dowel-pins, and a bar or strip O, that engages the notched edge, to the upper side of a bar P, that is screwed to the top side of the cross-bar M. The top side of the bar or strip O is flush with the upper surface of the notched plates, and said bar or strip forms one side of the die-opening. Alongside of the bar P and likewise screwed to the cross-bar M is a plate or bar Q, which contains the dies for cutting the paper to form the match-splints. Said dies are formed by a series of parallel pieces or strips of steel q and q, that are separated distances apart equal to their own thickness and are placed each in a groove in the upper side of said bar Q and there rigidly held by two strips or bars R and R, that engage the two ends of all of said pieces q and q and the upper side of projections q' and q' at both ends of each piece q. By making the dies of the series of pieces q and q, as above described, should breakage or injury occur to a die it can be easily and cheaply remedied by the replacement of the injured piece or pieces q with good ones, and, besides this, since tempered steel is necessary to be used in making the dies it would not do to form the latter by cutting or milling in a single block or bar and then temper the block or bar, as there would be disastrous derangement from tempering. It is best to employ a grooved bar, such as Q, that is not tempered and use therewith tempered die-pieces q and q. For similar reasons to those just above noted we make the dies n and n of a series of separate plates instead of one continuous plate.

Guided in vertical ways R and R rising from each end of the cross-bar M is a vertically-reciprocable head S, that upon one side carries a plate T, that has its lower edge formed into punches t and t to coöperate with the dies n and n, and upon its bottom a plate U, whose under side carries a number of punches u and u to coact with the dies q and q. The punches u and u have their cutting-faces inclined to produce a shear cut and also to carry the severed end of the splint that is forced into a space between two dies q and q well away from the end of the adjacent splint that lies upon the upper side of the die. The punches u and u operate to sever the end only of every other splint from the paper-stock for a purpose to hereinafter appear, and at the proper time those not thus severed are cut by means of a knife V, that is attached to the side of the head S opposite that to which the punches t and t are secured. The head S and the parts carried thereby are reciprocated from the main shaft W by means of two eccentrics X and X, each of which is connected to one side of said head by means of a rod or bar x. The connection between the head and the links is through a rod or bolt s, that is contained within an opening in said head and projects at opposite sides thereof sufficiently to pass into an opening in the link, being held in place by a cap or disk Y at each end that overlaps the link and is detachably united to the rod by means of a bolt or screw s'. By this construction to detach the head, with its parts, from the machine necessitates simply the removal of a cap Y at one end and the withdrawal of the rod from the opposite side. The ways R and R are of course slotted vertically for the passage of the rod or bolt s and to permit its vertical movement, and preferably a collar or bushing Z encircles the portion of the rod that is contained within the slot in each way. After being operated upon by the punches u and u and the knife V the card of splints thus formed is placed in the conveyer, by which it is transported to the paraffining and composition-applying devices and finally to the place of discharge from the machine. Said conveyer is in the form of an endless chain, which is composed of links that consist each of short parallel side pieces A^2 and A^2 and a number of flat thin bars a' and a' extending between such side pieces and each having pressed yieldingly against one side a flat strip or bar a^2. The latter are movable toward and from the bars a' and a' upon rods B′ and B′, that pass through the same and through the bars a' and a', which rods are secured at one end to the end one of said bars a'. A coiled spring C′ is placed around each bar B′ for each strip a^2 to hold the same yieldingly against its bar a' or against an interposed match-card, and as there is one strip a^2 at one end of the link which does not have a bar a' which can serve as an abutment for the end of the coiled spring to bear against a head or shoulder b' is provided upon the rod B′ as a bearing for the spring. Each pair of bars a' and a^2 constitutes a clamp that is normally closed by the action of the spring C′, and to open each for the reception of the card the following-described mechanism is employed:

Rising from the top sides of the two side pieces A′ and A′ is a frame composed of two vertical side bars D′ and D′ and a horizontal

bar E′, that connects the upper ends of the side bars, said side bars having grooves or ways in their inner sides to receive the sides of the chain and guide the latter. Journaled in a box F′ near the lower end of each side bar D′ is a short shaft G′, that at its inner end carries a curved or hook-shaped finger g', that by the rocking of the shaft may be moved into and out of engagement with the end of the clamping-bar a^2, that is projected for such purpose beyond the end of its mate a', and when engaged therewith acts to raise the same against the stress of the coiled springs C′ and C′. Said fingers g' and g' are located so as to act upon the clamp-bar a^2 when the opening formed by raising the same will be horizontally in alinement with the upper side of the dies q and q, so as to receive the match-card as it is moved from the latter. At the upper end of each bar is journaled in a box F^2 a similar shaft that carries a finger g^2 to open each clamp at this point to permit the removal of the match-card. The two fingers on each side of the machine are connected, so as to move in unison, by means of a link H′, and for imparting motion to them a horizontal shaft I′ is journaled in boxes J′ and J′, secured to the rear side of the vertical bars D′ and D, and at each end is connected by an arm i' with each link H′. Said shaft at one end has a crank-arm K′, which is connected by a rod or bar k' with a lever L′, that is mounted upon a short shaft l', which is journaled in one of the side pieces and to which is also attached a lever L^2, that has its free end in engagement with a cam M′ upon the main shaft W and by which cam said lever L^2 is at the proper time rocked.

To direct the blank in its passage from the dies q and q to the clamp, a guide-plate N′ is employed that is adapted to engage the blank upon the upper side and is preferably inclined, as shown, from its side away from the clamp down to the latter. Said guide-plate N′ has vertical arms n' and n', by which it is fastened to and supported from the two frame sides A′ and A′.

Ordinarily the match-card will fall out of the clamp as soon as the same is opened; but to insure the discharge thereof ejecting devices are preferably employed, which consist of two sliding pins O′ and O′, that are mounted in the cross-bar E′ in line with the opening that is formed when the bar a^2 is raised by fingers g^2 and g^2, which pins are each normally held retracted by a coiled spring o' and are moved to carry their ends into ejecting engagement with the match-card by means of an arm P′ for each that extends radially from the shaft I′. A suitable discharging-chute is provided, into which the match-cards fall and by which they are conveyed from the machine.

Movement is imparted to the chain conveyer by providing each side piece A^2 of each link with gear-teeth a^3 and a^3, which are adapted to mesh with two gear-wheels Q′ and Q′, that are mounted upon a shaft R′, which is journaled in boxes placed upon the side frame-pieces A′ and A′. Said shaft R′, and in consequence the gear-wheels thereon, are rotated step by step by means of a ratchet-wheel S′, which is secured to said shaft, and a pawl T′, that is carried by one arm of a bell-crank lever U′, whose other arm is connected by a rod V′ with an eccentric v upon the main shaft W. Backward movement of the ratchet-wheel is guarded against by the provision of a dog W′, pivoted to the machine-frame in position to engage the teeth of the wheel.

The chain-driving mechanism just described is for the purpose of imparting an intermittent motion to the chain, with periods of rest to permit the insertion of blank cards and the removal of finished cards of matches, such operation being characteristic of well-known forms of continuous match-machines, although other portions of the chain may be in constant movement. For imparting movement to other portions of the chain and also to actuate such other mechanisms as characterize the class of machines to which our invention belongs a shaft X′, similar to such as is found in the Beecher and Wright patent heretofore referred to, is provided, which, like the similar shaft in said patent, carries a sprocket-wheel x^2, from which the power is transmitted for the purpose just indicated, and which shaft X′ is driven from the main shaft W through a train of gears Y′, Y^2, and Y^3, arranged as shown.

The rotation of the main shaft W is effected by means of a band-wheel Z′; but as it is desirable to stop the operation of the punches and feed-rolls and actuate the chain and wax and composition applying mechanisms independently of the former, so as to complete such matches as may be left in the chain after the operation of the punches has been suspended, the following-described provision is made, viz: Said band-wheel Z′ is not fast upon the main shaft W, but is mounted loose thereon, and the gear for imparting motion to the sprocket-wheel x', the pawl-actuating eccentric v', and the clamp-opening cam are also not fastened to said shaft, but are mounted upon the hub of the band-wheel Z′, so as to revolve with the latter. Suitably fastened to the shaft W, by shrinking or otherwise, alongside of one end of the hub of the band-wheel Z′, is a collar A^3, having several openings a^3 through it that extend parallel with the axis of the shaft and which are adapted to be placed in coincidence with perforations z' and z' in said hub.

Slidingly mounted upon the shaft W, adjoining the collar A^3, is a collar B^2, that carries a series of projecting pins b^2 and b^2, that enter the openings a^3 of the collar A^3 and are adapted by the movement of the collar B^2 along the shaft to be placed in and out of engagement with the perforations z' and z' in the hub of band-wheel Z, and thus lock the latter into and release it from engagement

with the shaft W. The clutch-collar B^2 is adapted to be moved by means of a hand-lever C^2, that has a customary connection with it and is pivoted at its lower end to an arm or bracket D^2, that is bolted to the bed-plate A and journals one end of the shaft W.

If the matches are to be what are commonly called "safety-matches," it is desirable to apply to each card the customary complementary igniting composition, and for this purpose the following-described mechanism is employed: The paper or other stock from the roll B is guided by the plate C to the under side of a plate E^2, and immediately after leaving said plate C the igniting composition is applied to the paper, which composition, in liquid form, is contained in a suitably-supported tank F^3, into and out of which, at suitable intervals apart, an applying device in the form of a horizontal bar G^2 is moved, its outward movement being such as to cause its upper surface to be placed into contact with the paper against the under side of the plate E^2. Said bar G^2 is carried at the end of a rod H^2, that is reciprocated in a vertical guide-post I^2, mounted upon the plate E^2, which rod H^2 is moved at the proper times from a cam J^2, that is formed upon the periphery of the crank-plate on the shaft W, the connection between the cam and rod being through crank-arms L^3 and L^4 upon a rock-shaft l', the former of which engages the cam, and a link M^3, that extends between the other arm L^4 and the rod H^2. The shaft of the cam J^2 is such that the bar G is first lifted out of the tank and then pauses to permit surplus composition to drip off before being further moved to apply the composition to the paper.

The operation of our machine is as follows: At each partial rotation of the feed-rollers E and E the paper is drawn off the roll B an amount equal to the length of the splints and the portion to which they are attached and placed upon the dies n and n and q and q and in its transit from the rolls to the dies being incised or cut partially through in three equidistant places. Coming to a rest upon the dies the punches descend and punch the openings which form the head or composition-receiving portions of the matches and alternate splints into the die-spaces, such alternate splints thus being entirely severed from the stock, except at their base ends, and being made to stand at their free ends well away from the corresponding ends of the adjacent splints, whose said ends still remain attached to the stock. It will be understood that although both sets of punches operate simultaneously they do not at the same time act to form the same splints, but, in fact, in succession to produce a given set of splints. The two sets of dies and punches are situated a distance apart equal to the length of a match-card, and hence it is not until the paper is fed after the V-shaped notches have been punched that the portion thereof between two lines of such matches is placed in position for the action of the splint-cutting dies and punches. The card-blank, still attached to the paper-stock by the unsevered connection between alternate splints and such stock, is passed from the dies to the endless chain and the base or butt portion of the card inserted between the clamping-bars a' and a', which by the action of the lower pair of fingers g' and g' have been opened for its reception and immediately closed. As the punches descend to form splints out of the stock placed upon the dies by the feeding operation which feeds the blank into the clamp, the knife carried by the head S cuts the hitherto-uncut splints from the stock, and the thus completed blank is at liberty to move with the chain and be carried by the latter first to the paraffining device, then to the composition-applying mechanism, and, finally, after having had opportunity to dry or be dried, is released from the clamp by the action of the clamp-opening fingers g^2 and g^2 and the expelling devices. Owing to the separation of the free ends of adjacent splints, heretofore mentioned, the dipping thereof is effected without liability of composition extending across from one to the other. After leaving the machine the card of completed matches is divided in two upon the line of the middle incision, which is made deep enough to enable the division to be effected by simply bending the card, and then each half is folded upon the line of the remaining incision, such latter not being deep enough to cause complete separation, but serving as a guide for the easy and convenient folding of the half-card, and since it is not deep enough for complete separation in forming a book of cards as far as each thus folded card is concerned no application of glue to hold the folds together is necessary, except where the two opposite free edges come together.

While our invention has been designed especially for the manufacture of matches from paper, it is of course to be understood that we do not limit ourselves to the use of any particular material, and we also wish it understood that we do not confine ourselves to the precise embodiment of our invention as the same is herein shown and described, as changes in form can be made which will constitute no change in principle.

Having thus described our invention, what we claim is—

1. In a machine for making match-cards, the combination of mechanism for forming the card from suitable stock, constructed to leave the card attached to the stock, a carrier to which the card is fed, and means for separating the card from the stock, after the card is placed in the carrier, substantially as and for the purpose described.

2. In a machine for making match-cards, the combination of mechanism for forming a card from suitable stock, constructed to leave some of the splints attached at one end to the stock, a carrier to which the card is fed, and

means for separating the said attached splints from the stock after the card is placed in the carrier, substantially as and for the purpose described.

3. In a machine for making match-cards, the combination of cutting devices for forming the head or composition-receiving parts of splints, cutting devices for forming the body parts of splints that leave certain splints attached to the stock at their head ends, a carrier to which the card is fed, and means for severing the uncut splints from the stock after the card is placed in the carrier, substantially as and for the purpose described.

4. In an automatic machine for making matches from paper, or like stock, the combination of mechanism for forming a card, or series of splints attached to a common part, a carrier for conveying said card to match-finishing mechanism, and transfer or feeding mechanism for transferring the card from the forming mechanism to the carrier, substantially as and for the purpose set forth.

5. In a machine for making matches from paper, or like stock, the combination of dies and punches for forming heads of splints, dies and punches for forming the bodies of splints, so that they are attached to a common part, or form a card, a carrier for conveying the card to match-finishing mechanism, and feeding mechanism that moves the card directly from the forming mechanism to the carriers, the part of said mechanism by which the card part to which the splints are attached is formed being nearest the carrier, whereby said part may be moved directly thereto, substantially as and for the purpose described.

6. In a machine for making matches from paper or like stock, the combination of a series of dies formed of alternating bars and spaces, the stock-cutting edges of the bars that lie in a plane running in the same direction as the adjacent surface of the stock, when the latter is in position to be acted on thereby, being straight, and the width of each bar and space being the same as that of the match-splint to be formed, and a punch likewise formed of alternating bars or projections and spaces to coöperate, respectively, with the spaces and bars of the dies, substantially as and for the purpose described.

7. In a machine for making matches from paper, or like stock, the combination of a series of dies formed of alternating bars and spaces, the width of each bar and space being the same as that of the match-splint to be formed, and a reciprocating punch, likewise formed of alternating bars or projections and spaces, to coöperate respectively, with the spaces and bars of the dies, substantially as and for the purpose described.

8. In a machine for making matches from paper, or like stock, the combination of a series of dies formed of alternating bars and spaces, the stock-cutting edges of the bars that lie in a plane running in the same direction as the adjacent surface of the stock when the latter is in position to be acted on thereby, being straight, and the width of each bar and space being the same as that of the match-splint to be formed, a punch likewise formed of alternating bars or projections and spaces, and an intermittently-acting feed mechanism for moving stock to the dies, substantially as and for the purpose described.

9. In a machine for making matches from paper and like material, the combination of two series of dies, one of said series being for forming the head, and the other the body portions of splints and the two coacting series of punches for said dies, the dies and punches for forming said body portions, being each composed of alternating bars and spaces, the width of each bar and space being the same as that of the splint-body to be formed, substantially as and for the purpose described.

10. In a machine for making matches, the combination of two series of dies, and a series of punches for each series of dies, one of said series of dies and punches operating to form the head portions of splints and the other the body portions thereof, and the two series operating, by successive action, to produce complete splints, the dies and punches for forming the body portions of splints being each composed of alternating bars and spaces, and the width of each bar and space being the same as that of the splint-body to be formed, substantially as and for the purpose specified.

11. In a match-making machine, the combination of two series of dies, a series of punches for each series of dies, one of said series of dies and punches operating to form the head portions of the splints, and the other the body portions thereof, and the two series operating by successive action to produce complete splints, and means for feeding stock to the head-forming dies and punches first, substantially as and for the purpose described.

12. In a match-making machine, the combination of two series of dies, two corresponding series of punches, one of said series of dies and punches operating to form the head portions of splints, and the other the body portions thereof, and the two series operating, by successive action, to produce complete splints, means for causing the simultaneous action of both series of punches, and means for feeding stock to the head-forming dies and punches first, substantially as and for the purpose specified.

13. In a match-making machine, the combination of two series of dies, two series of punches that operate by successive action to produce the head and body portions of the splints, a reciprocable head that carries both series of punches, and means for feeding stock first to the punches that form the head portions of the splints, substantially as and for the purpose shown.

14. In a machine for making cards of matches, the combination of two series of dies and punches, that operate by successive ac-

tion to make the head and body portions of a set of splints, a knife situated to cut the stock at such point that the splint will be attached to a common part, and means for simultaneously moving the punches and knife, substantially as and for the purpose described.

15. In a machine for making cards of matches, the combination of a reciprocable head, punches forming the head portions of splints, separate punches for forming the body portions thereof, dies for coacting with each set of punches, and a knife, the latter and said punches being attached to said head, and at such distances apart that the splints, when formed, will be attached to a common part, substantially as and for the purpose described.

16. In a machine for making cards of matches, the combination of dies composed of properly-spaced bars and punches, corresponding to said dies that are constructed to cut alternate splints of the same card, from the stock, except at one end, substantially as and for the purpose set forth.

17. In a machine for making cards of matches, the combination of dies composed of alternate bars and spaces, punches corresponding thereto, that punch alternate splints from the stock, except at one end, and leave the remaining splints attached at both ends, a carrier to which the blank is fed, and a knife for cutting the ends of splints still attached to the stock after the blank has been placed in the carrier, substantially as and for the purpose described.

18. In a machine for making cards of matches from stock in the form of sheet material, the combination of suitable splint-forming devices, and means separate from the latter for scoring or incising the portion of the card not formed into splints, substantially as and for the purpose set forth.

19. In a machine for making cards of matches, the combination of splint-forming mechanism, constructed to form splints attached at one end to a common part, and means for scoring or incising the stock before it reaches such mechanism, whereby the piece to which the splints are attached is scored or incised, substantially as and for the purpose described.

20. In a match-machine, the combination of mechanism for forming cards of match-splints from strip-form stock, with the splints extending lengthwise of the strip, and automatic mechanism for applying match-head-igniting substance to the stock before it is fed to the splint-forming mechanism, on a portion of such stock, which is not to be formed into splints, substantially as and for the purpose described.

21. In a match-machine, the combination of mechanism for forming cards of match-splints from strip-form stock, with the splints extending lengthwise of the strip, a holder for a match-head-igniting substance, past which the stock from which the cards are formed moves, automatic mechanism whereby said substance may be applied to such stock, and feeding mechanism for feeding the stock from the point where such substance is applied, to the splint-forming mechanism, substantially as and for the purpose described.

22. In a match-machine, the combination of mechanism for forming cards of match-splints from strip-form stock, with the splints extending lengthwise of the strip, a receptacle for containing a match-head-igniting substance, past which the stock from which the cards are formed moves, an automatic mechanism to take such substance from the receptacle and apply it to the part of the stock not formed into splints, and feeding mechanism for feeding the stock from the point where such substance is applied to the splint-forming mechanism, substantially as and for the purpose described.

23. In a machine for making match-cards, the combination of a series of splint-forming dies and punches, both with stock-engaging faces, the faces of the dies being opposite the spaces of the punches, and the faces of one of the series being inclined in the direction of the length of the splints, each space and face being substantially equal to each other in width, and to the width of a splint, substantially as and for the purpose described.

24. In a match-card-making machine, the combination of a source of supply of stock, as paper, the igniting-composition-applying devices, feed-rolls, scoring or incising means, splint-forming mechanism, separate from the latter, and a carrier for conveying the card from point to point to complete the matches thereon, substantially as and for the purpose described.

25. In a match-card-making machine, the combination of a source of supply of paper, a receptacle for an igniting composition, a part movable into and out of the latter to apply the composition to the paper, the intermittently-acting feed-rolls, a cam from which the latter and the composition-applying part are actuated, the scoring-disks, splint-forming punches and dies, and a carrier for conveying the card from the splint-forming mechanism to the match-completing devices, substantially as and for the purpose set forth.

26. In a die, the combination of a grooved plate, separate die-pieces consisting each of a straight bar, placed in the grooves in said plate, and a bar at each of the ends of said pieces to engage and hold the same in the grooves in the plate, substantially as and for the purpose set forth.

27. A die for match-making machines consisting of a base-plate, a number of die-plates secured thereto, having notched edges, and a bar placed against said edges and secured to the base-plate, substantially as and for the purpose set forth.

28. In a machine for making match-cards, the combination of the plates having V-shaped notches in their edges, a bar placed against

the latter and forming therewith die-openings, a plate having a series of grooves containing each a die-forming bar, and punches to coöperate with the dies, substantially as and for the purpose described.

29. In combination with a sliding head, the guideways therefor, the rod running through said head from side to side, detachable devices at each end of the rod to secure the same in place, the rod being adapted to be drawn through the head, when either of said devices is removed, and means for moving said head that are connected with such rod, substantially as and for the purpose set forth.

30. In combination with a sliding head, the guideways therefor, the rod running through said head, the links connecting the rod to means for moving the same, and a detachable securing-cap at each end of said rod, the latter being adapted to be drawn through the head when either cap is removed, substantially as and for the purpose described.

31. As an improvement in machines for making match-cards, the carrier composed of a chain each link of which consists of side pieces having gear-teeth, and connected by a series of bars, and a series of movable bars adapted to coöperate with the latter, substantially as and for the purpose described.

32. As an improvement in machines for making match-cards, a carrier having card-holding clamps that consist each of a fixed and a movable bar, guide-rods for the latter, coiled springs placed around the rods, for normally moving said movable bar toward the other bar and side pieces having gear-teeth, to which the fixed bars are attached, substantially as and for the purpose set forth.

33. As an improvement in machines for making match-cards, the combination of a carrier having card-holding clamps, two sets of pivoted fingers for opening said clamps, connections between said fingers whereby they may be moved simultaneously, and means for moving said fingers, substantially as and for the purpose described.

34. As an improvement in machines for making match-cards, the combination of a carrier having card-holding clamps, two sets of pivoted fingers for opening said clamps, bars connecting the two sets of fingers, a rock-shaft for moving said bars, and means for actuating the rock-shaft, substantially as and for the purpose specified.

In testimony that we claim the foregoing we have hereunto set our hands this 12th day of December, A. D. 1894.

CHARLES H. PALMER.
JOHN W. DENMEAD.

Witnesses:
EDWIN F. VORIS,
CHAS. C. BENNER.