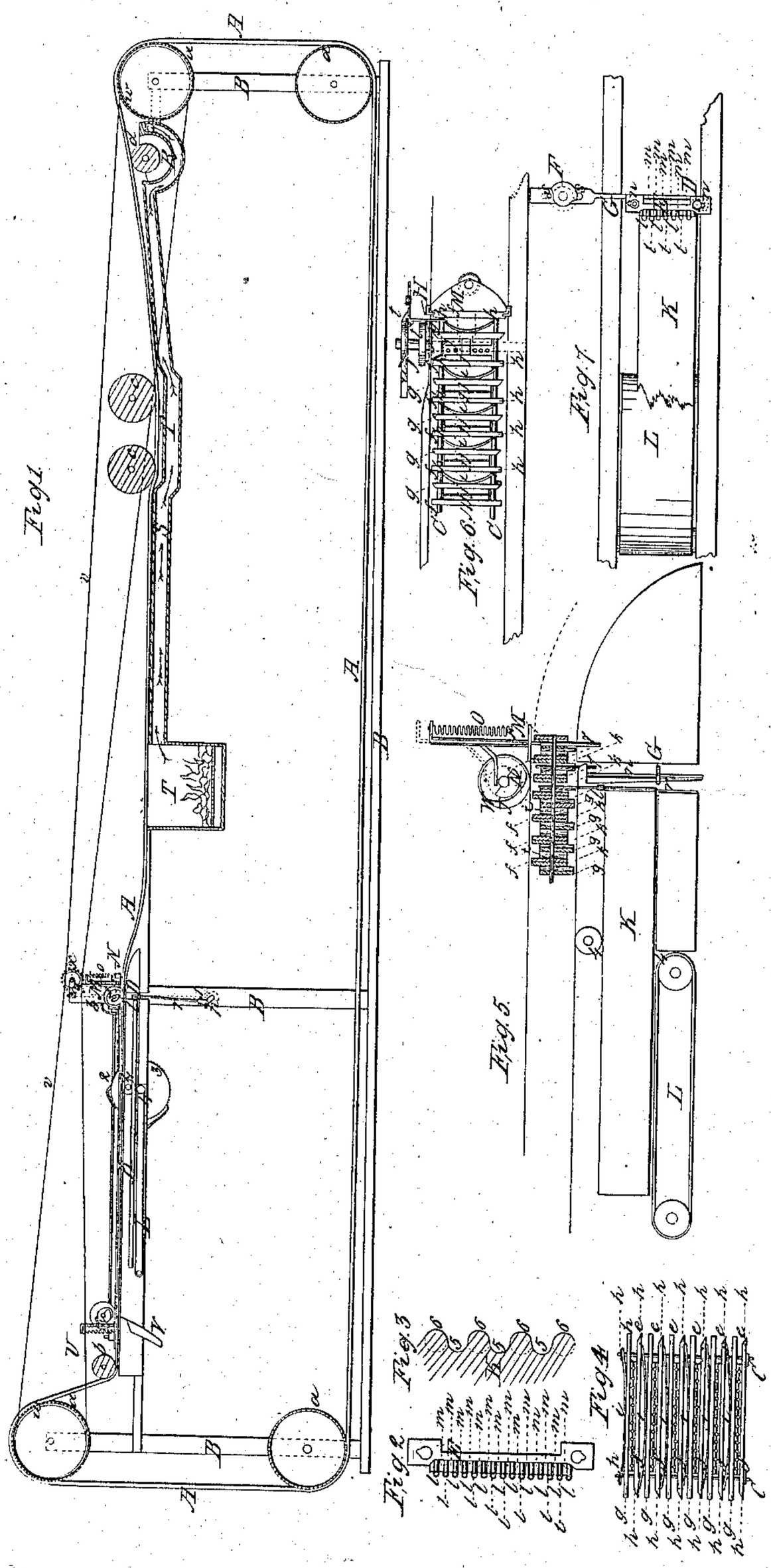
W. GATES, Jr. & H. J. HARWOOD.

MACHINE FOR MANUFACTURING FRICTION MATCHES.

No. 10,737. Patented Apr. 4, 1854.



UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MACHINES FOR MAKING FRICTION-MATCHES.

Specification forming part of Letters Patent No. **10,737**, dated April 4, 1854.

To all whom it may concern:

Be it known that we, WILLIAM GATES, Jr., of Frankfort, in the county of Herkimer and State of New York, and H. J. HARWOOD, of Utica, in the county of Oneida and State of New York, have invented a new and useful Machine for Manufacturing Friction-Matches; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being made to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a longitudinal vertical section of our improved machine. Fig. 2 is an inverted plan or an under view of the cutting-tool for cutting the match-sticks. Fig. 3 is a descriptive view showing the manner in which the cutting-tool acts upon the block and cuts the match-sticks therefrom. Fig. 4 is a plan or top view of a section of the endless chain of clamps. Fig. 5 is an enlarged section of the machine, side view, showing the manner in which the match-sticks are placed between the clamps forming the endless chain. Fig. 6 is an enlarged section of the machine, plan or top view, showing the manner in which the clamps of the endless chain are forced apart in order to receive the match-sticks. Fig. 7 is an enlarged section of the machine, plan or top view, showing the manner in which the cutting-tool is shifted, so as to act properly upon the block.

Similar letters of reference indicate corresponding parts in each of the several figures.

This invention relates to a new and improved machine for manufacturing friction-matches; and it consists, first, in having an endless chain formed of a series of clamps, constructed and arranged as will be hereinafter shown, by which the match-sticks as they are cut from the block are taken from the cutting-tool, and their ends are dipped in the sulphur and igniting compound.

Our invention consists, second, in a cutting-tool of peculiar construction, by which the match-sticks are cut smoothly and easily from the block and separated from each other, so that they are received by the clamps of the endless chain at certain distances apart. This will be hereinafter fully described.

Our invention consists, third, in a peculiar manner of operating the clamps of the endless chain, so that they may receive the match-sticks from the cutting-tool.

To enable others skilled in the art to make and use our invention, we will proceed to describe the construction and operation.

A, Fig. 1, represents an endless chain formed of a series of clamps. This chain passes around four toothed wheels *a a a a*, underneath three small pulleys *b c c*, and over a small pulley or roller *d*. Said toothed wheels and pulleys are placed or hung in a suitable frame B, as shown in Fig. 1.

The clamps of which the endless chain is formed are designated by the letter *e* and are shown in the enlarged sections 4, 5, and 6. The clamps are formed of wooden slabs *f g*, which are placed between stops *h* on wires C C, one of which passes through each end of the slabs, as seen in Fig. 4. Each pair of slabs *f g* is acted upon by a spring *i*, the back of which bears against the slab *g*, the outer ends of the spring bearing against two stops *h*. The face sides of the slabs *f g* are provided with felt or cloth coverings *j*. The wires C C connect the several clamps *e* together and form an endless chain. The slabs *g* of the several clamps are not placed quite so high as the other slabs *f*, and consequently spaces *k* (seen in Fig. 5) are left between the slabs *g*, in which the teeth of the wheels *a* catch.

D in Figs. 2 and 5 is the cutting-tool, which is formed of a series of circular cutters *l*, connected by semicircular cutters *m*. (See the inverted plan in Fig. 2.) The cutting-tool D cuts the match sticks from the block in the direction of the grain of the wood. Both series of cutters are secured to a proper stock E, and the stock works on proper guide-rods *n n* on the frame B. The position of the cutting-tool in the frame is shown in Figs. 1, 5, and 7. One of the guide-rods *n* is shown in Fig. 5, and the tops of both are shown in Fig. 7. The circular cutters *l* only cut the match-sticks from the block entire, as will be hereinafter shown. The cutting-tool has a vertical reciprocating motion communicated to it by means of a crank *p* and connecting-rod *r*. (Seen in Fig. 1.)

F in Fig. 7 is a cam, by which the position of the cuting-tool is shifted at every stroke.

This cam F works or rotates between pins *s s* on a bar G, which is connected to the cutter-stock E.

H in Fig. 6 is a wedge attached to a bar I, which has a lateral motion communicated to it by means of a cam J, which works between piks *t t* on an arm *u* of the bar I. The wedge by the operation of the cam J is forced at the proper time between the clamps and separates or opens them to receive the match-sticks. The bar I also has a longitudinal motion communicated to it by a cam W, in order that the wedge H may move while in the clamp in a direction with the chain. The cam W is on the same shaft as a cam N, which operates a hammer M, hereinafter described.

The endless chain A, formed of the clamps *e*, is placed around the four toothed wheels *a a a a*, as shown in Fig. 1, it being recollected that the teeth of the wheels *a* catch into the spaces *k* between the slabs, as previously stated.

The proper feed motion is communicated to the chain A by means of bands *v v*, which pass around pulleys *w w* on the shafts of the two upper toothed wheels *a*, said bands also passing around pulleys or a drum *x* on a small shaft *y*, which may receive motion from a vertical rod *z*, connected by bevel-gearing 1 with the rod of the crank *p*. The bands *v v* and pulleys *w w* are shown in red color in Fig. 1, and the vertical rod *z* and the bevel-gearing 1 are indicated by dotted lines in the same figure.

K in Figs. 1, 3, 5, and 7 is the block from which the match-sticks are cut. This block is placed upon an endless apron L, directly in front of the cutting-tool D and between the rollers 4 4, as seen in Figs. 1 and 5. The feed motion is given to the apron L by means of a pawl 2 and ratchet 3, motion being communicated to the pawl in any proper manner.

Operation: As the crank *p* is turned a vertical reciprocating motion is given to the cutting-tool D, which as it passes down upon the edge of the block K cuts it in the form shown in Fig. 3, the circular cutters *l* cutting entire match-sticks from the block and forming the concave portions 5 and the semicircular cutters *m* forming the convex portions 6. At the next stroke of the cutting-tool it is shifted or moved laterally by the cam F, so that the circular cutters *l* will cut out the remaining half-circle of the convex portions 6, which were formed at the previous stroke. The following or third stroke is the same as the first, the cutters *l* cutting out entire match-sticks every alternate stroke, and in the intermediate strokes finishing or cutting out in match-sticks the convex portions 6, formed by the semicircular cutters *m* during the preceding or first stroke. The match-sticks are retained in the cutters *l* during the upward movement of the cutting-tool, and as the said tool passes upward the match-sticks enter between the clamp, which is directly over the cutting-tool, the said clamp being forced open by the wedge H, which is operated at the proper time by the cam J, as shown in Fig. 6.

In Fig. 5 the match-sticks (designated by a figure 7) are shown between one of the clamps, the cutting-tool D being in the act of descending. As the cutting-tool descends, the wedge H is withdrawn by the cam J and the match-sticks are secured in the clamp, the spring *i* forcing or pressing the slab against the slab *f*, and the match-sticks remaining fixed between the felt or cloth coverings *j j*. It will now be seen that by the above operation the clamps *e* of the endless chain are filled with the match-sticks as they are cut from the block K by the cutting-tool, and they are placed in the clamps at a requisite distance apart, corresponding to the spaces between the cutters *l* on the cutting-tool. As the endless chain moves along, a hammer M above the chain, operated by a cam N and spiral spring O, descends at proper intervals upon the tops of the match-sticks and forces downward the tops of any match-sticks that may be elevated above the top surface of the clamps. By this operation the lower ends of the match-sticks will be on a perfect level, and all will be perfectly dipped and covered with the sulphur and igniting compound.

The sulphur is placed in a basin or reservoir P and the igniting compound in a semicircular basin R, and under both of these basins a flue S runs, which is connected with a furnace T. (See Fig. 1.)

The endless chain, as it moves over the furnace and flue, warms the lower ends of the matches, and the pulleys *c c* depress the chain and dip the ends of the matches into the basin P containing the sulphur, and the chain, still passing along the roller or pulley *d*, covers the ends of the match-sticks with the igniting compound in the semicircular basin R. The chain then passes around the two lower toothed wheels till the matches reach the hammer U, which is constructed precisely similar to the hammer M. The hammer U forces the matches from between the clamps and they fall through a spout V into a proper receptacle beneath.

By constructing the cutting-tool D as described the match-sticks are placed in the clamps at requisite distances apart, so that they will not be cemented together when dipped or when their ends are covered with the sulphur and igniting compound.

The endless chain of clamps performs its work admirably in practice, and matches are perfectly made direct from the block, requiring no subsequent manipulation whatever, except that of boxing them up in the usual quantities for sale.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The employment or use of the endless chain A, formed of a series of clamps *e*, constructed and arranged substantially as herein shown, for the purpose of receiving the match-

sticks from the cutting-tool and conveying them to the sulphur and igniting compounds with which their lower ends are covered, as shown and described in the body of the specification.

2. The peculiar form of the cutting-tool D, as herein shown and described—viz., said tool being formed of a series of circular cutters *l*, connected by semicircular cutters *m*, by which form the match-sticks are placed in the clamps of the chain A at a sufficient distance apart to prevent their lower ends from being cemented together when immersed in the sulphur and covered with the igniting compound, said tool also, by being constructed as described, cutting the match-sticks smoothly and easily from the block.

3. Opening or parting the clamps *e* of the chain A at the proper time or when each clamp is directly over the cutting-tool D by means of the wedge H, operated by the cam J or its equivalent, for the purpose of allowing the match-sticks to enter the clamps as the cutting-tool ascends to the top of the block, as herein shown and described.

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Witnesses:
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