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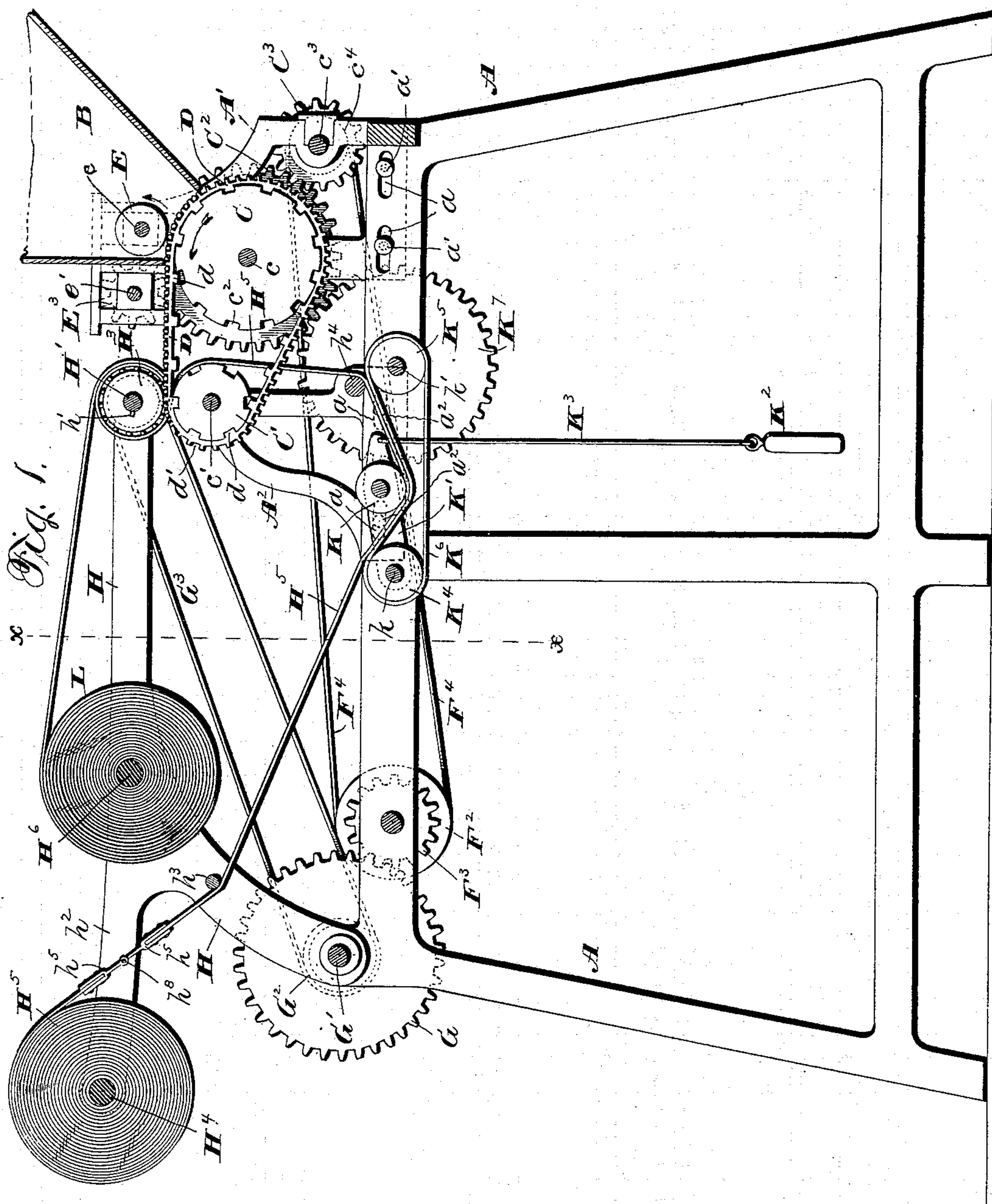
Patented Dec. 6, 1898.

C. J. DONNELLY.
MACHINE FOR BUNDLING MATCH SPLINTS

(Application filed Apr. 19, 1893.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses
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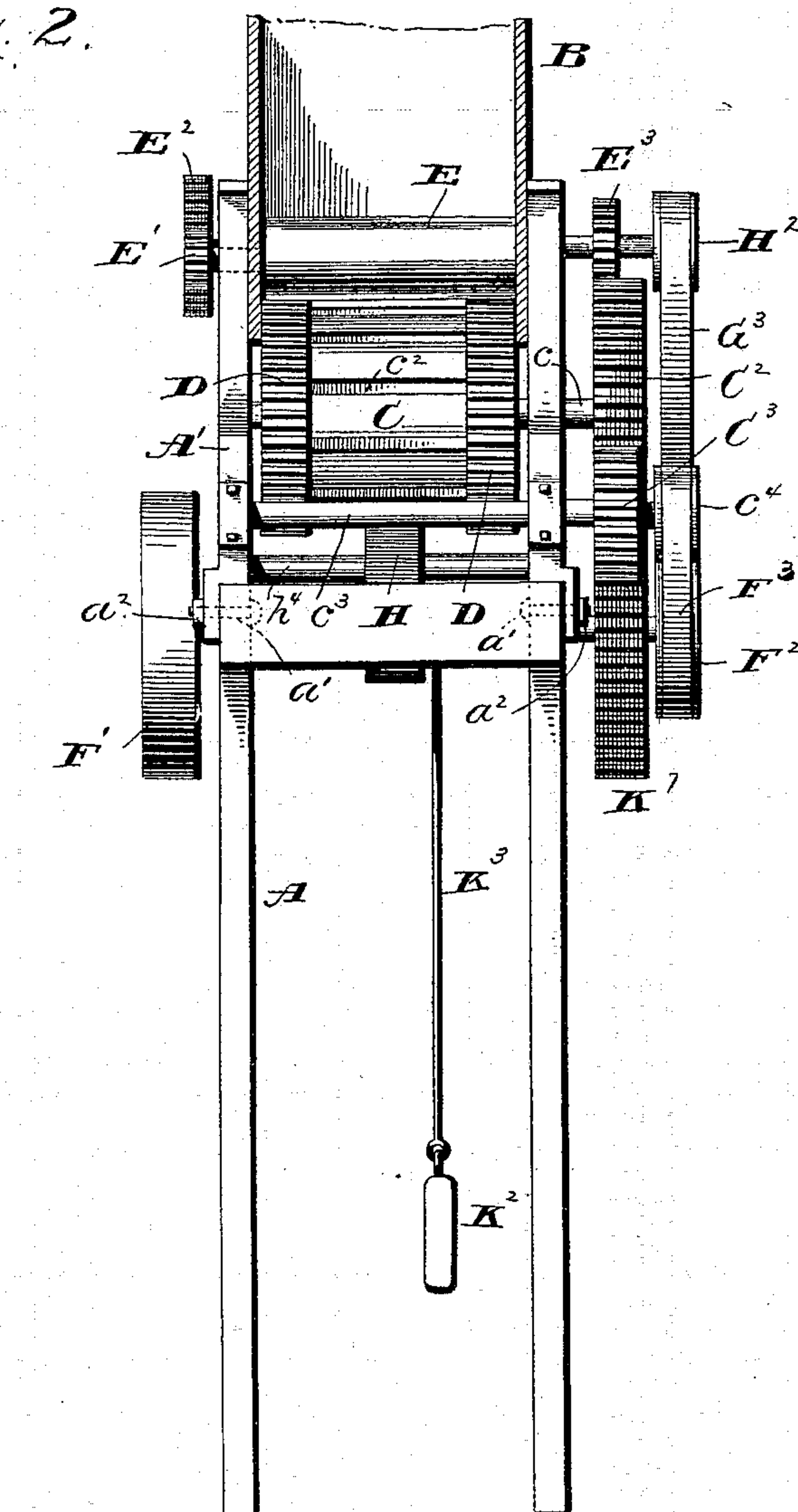
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Fig. 2.



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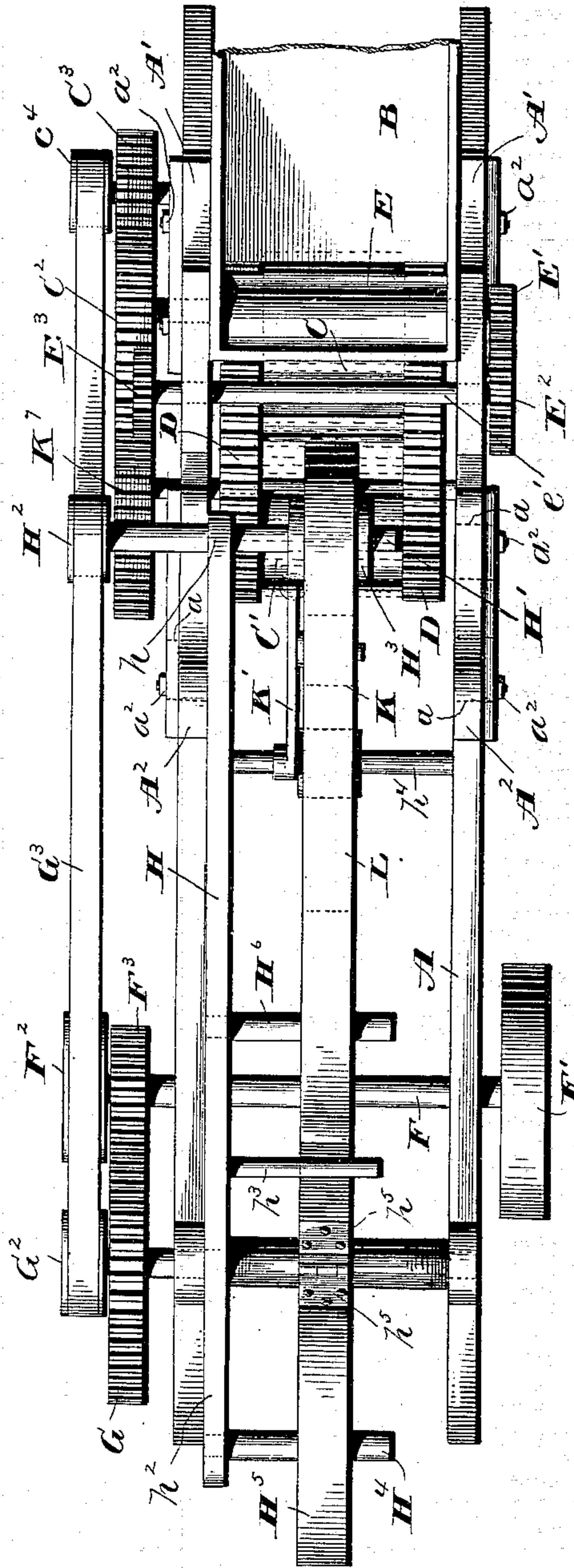


Fig. 5.

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4 Sheets—Sheet 4..

Fig. 4.

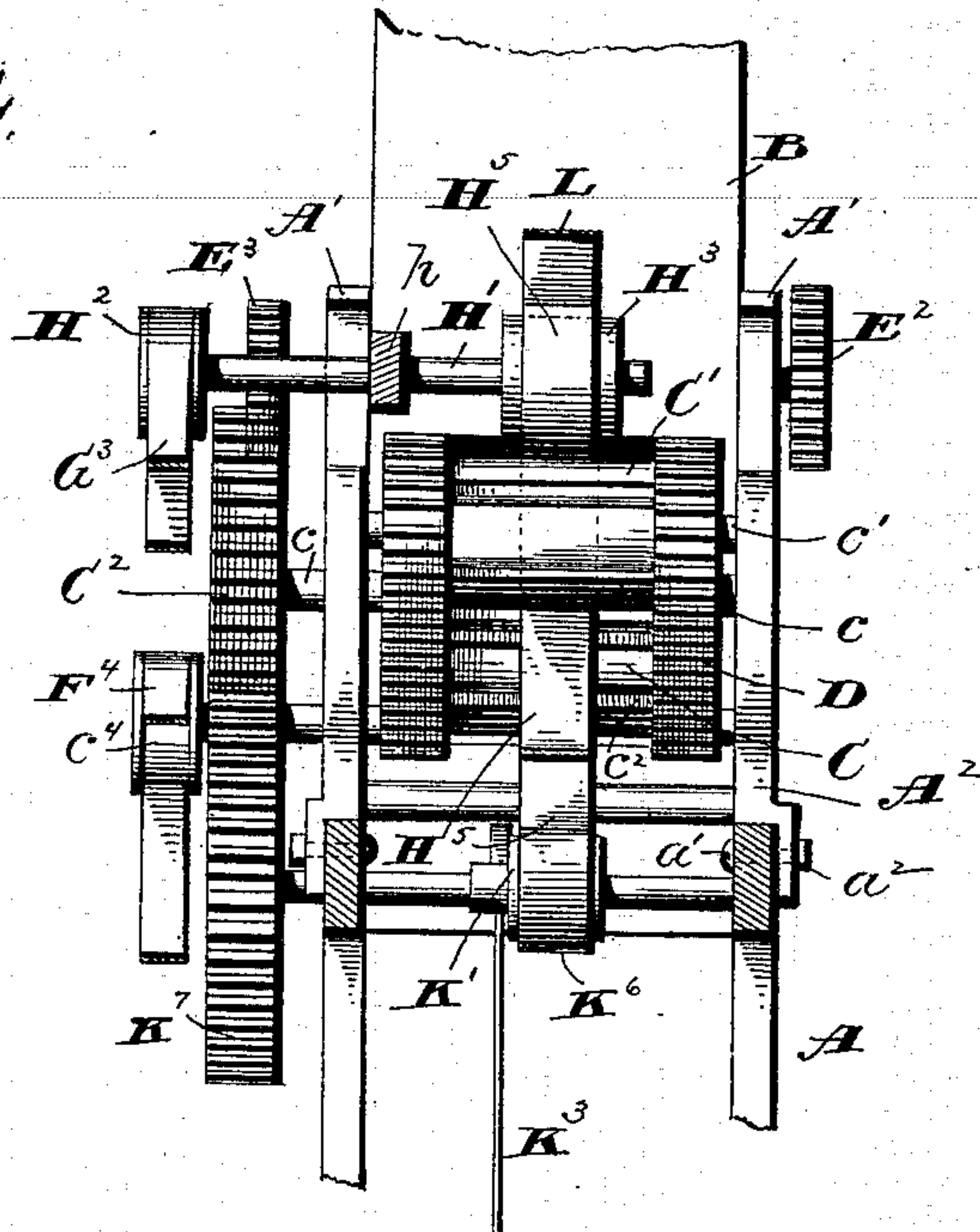


Fig. 5.

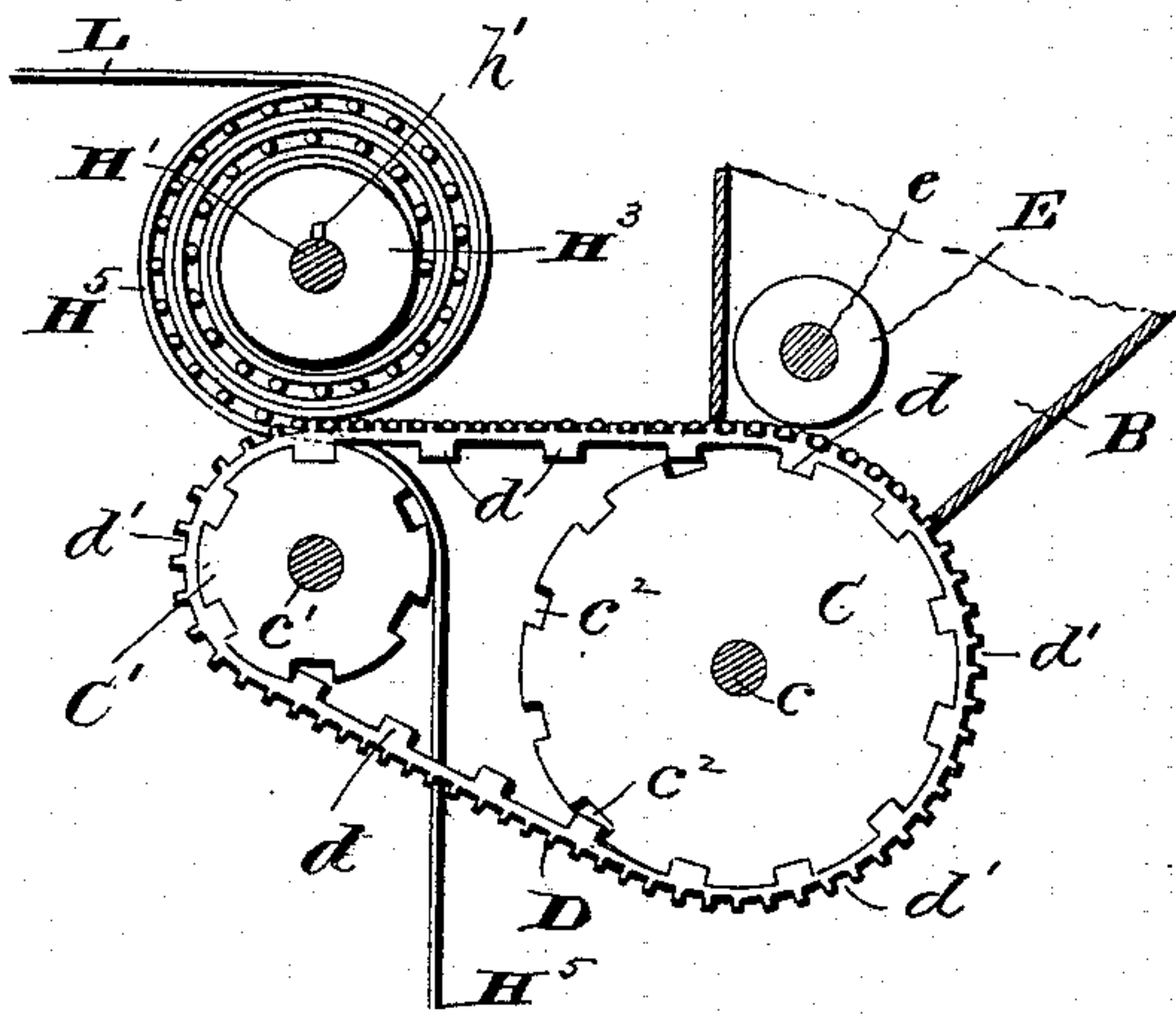


Fig. 6.

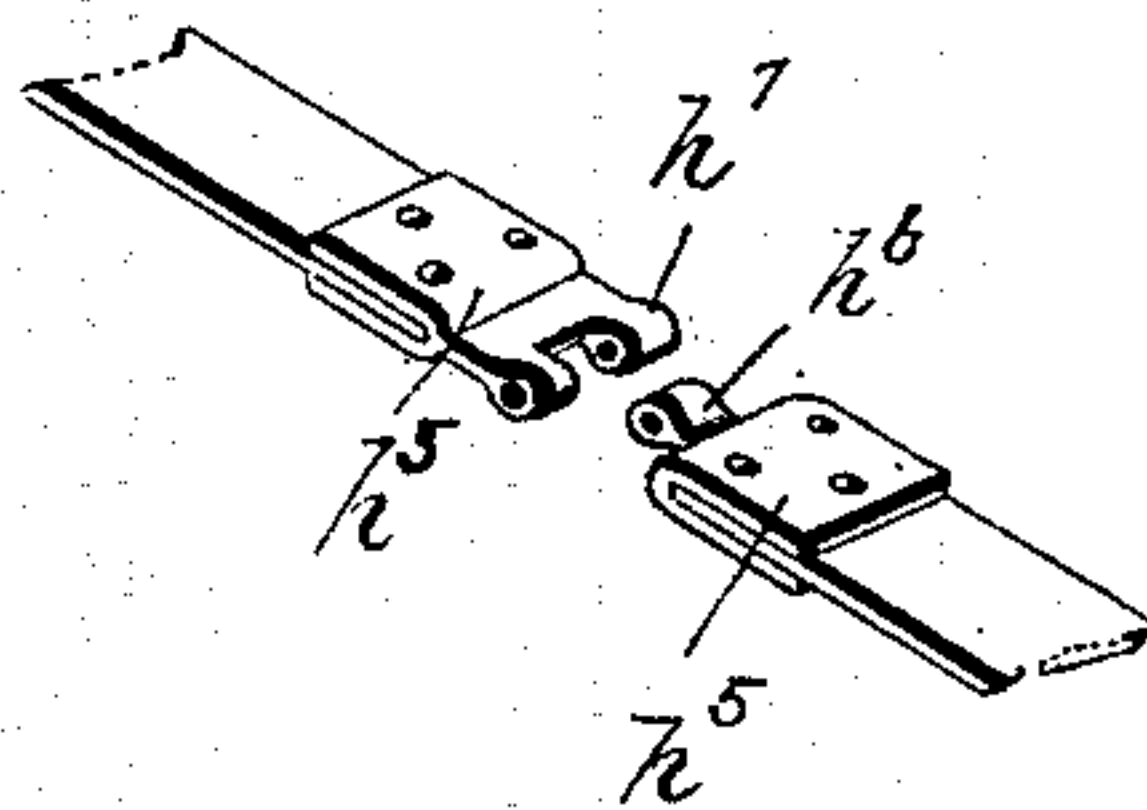
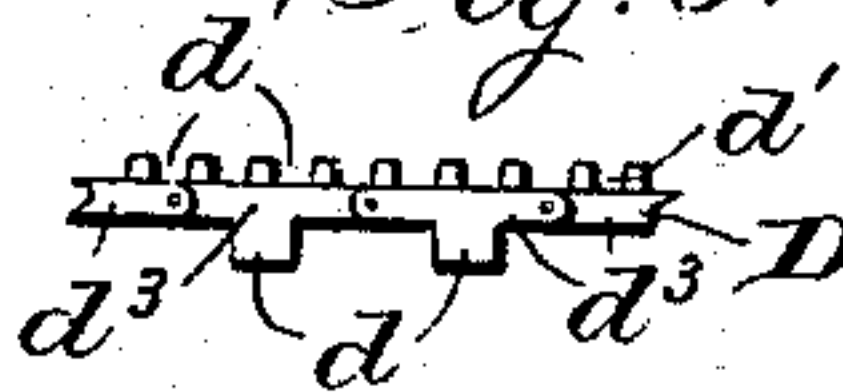


Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES J. DONNELLY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
THE DIAMOND MATCH COMPANY, OF ILLINOIS.

MACHINE FOR BUNDLING MATCH-SPLINTS.

SPECIFICATION forming part of Letters Patent No. 615,610, dated December 6, 1898.

Application filed April 19, 1893. Serial No. 470,986. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. DONNELLY, a citizen of the United States of America, residing at Philadelphia, in the county of Philadelphia, and in the State of Pennsylvania, have invented certain new and useful Improvements in Machines for Bundling Match-Splints; and I 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 shows a view of my machine in longitudinal section; Fig. 2, a view in elevation of the front end of the same; Fig. 3, a plan view of the same; Fig. 4, a view of a section of the machine on line xx of Fig. 1; Fig. 5, a detail enlarged view showing in side elevation the means for taking and conveying the splints from the hopper and a roll of tapes or bands with the splints between them, the frame and the side of the hopper being removed to expose the operative parts; Fig. 6, a detail perspective view showing the means for connecting the ends of two splint-bundling tapes or bands, and Figs. 7 and 8 detail views showing in side elevation certain modifications of the splint-conveying feed-belts.

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

The object of my invention has been to provide an improved machine for rolling match-splints up into bundles to prepare them for subsequent treatment by "dipping;" and to this end my invention consists in the machine and in the parts thereof constructed, arranged, and combined as hereinafter specified.

In the drawings, A designates the main frame, which can be of any desired material and construction. I prefer to make it as shown in the drawings, consisting mainly of upright side portions having at their tops longitudinal beams and connected at or near their tops and bottoms by suitable cross bars or beams. At the forward end of such frame is a supplemental frame A' , extending upward from the latter and supported thereon, so as to be adjustable longitudinally along the same. To thus support frame A' , I provide it on each side with projecting bolts $a' a'$, which, engaging and extending out through

slots $a a$ in the side bars of the main frame, have on their outer ends suitable nuts $a^2 a^2$ to engage the outer sides of such bars. With this construction the supplemental frame can be readily adjusted forward or back on the main frame, when the nuts $a^2 a^2$ are loosened and then fixed at any desired point of adjustment by screwing the nuts inward again. Supported on this supplemental frame A' is the splint-holding hopper B, with its front or outer side made inclined downward and inward to the open hopper-bottom, as shown.

A drum C, supported on shaft c , journaled in frame A' , is so situated that a portion of its periphery comes directly below the hopper-opening, so as to travel past the same as the drum turns in the direction indicated by the arrow.

A second supplemental frame A^2 , preferably adjustably supported on the main frame in the same manner as frame A' —that is, by bolts $a' a'$ engaging slots $a a$ and having the fastening-nuts $a^2 a^2$ —carries a smaller drum C' , having its shaft c' parallel with shaft c , journaled in suitable bearings in the frame sides. Over these two drums run the two parallel endless belts D D, arranged on opposite sides of the central portions of the drums at some distance apart, for a purpose which will appear from the description given hereinafter. Each of these belts has on its inner or under side a series of projections $d d$, which are engaged by correspondingly arranged notches $c^2 c^2$ in the two drums, so that the travel of the belts will be equal and uniform as the drums revolve. In their upper or outer sides are notches or pockets $d' d'$, which, being so arranged that those on one belt come exactly opposite or in line with those on the other, are of such size and shape as to receive and hold single match-splints in them, as indicated in the drawings. They are made just wide enough to allow the single match-splints to drop easily into them as they are carried along by the movement of the belts over drum C and under the mass of splints in hopper B.

While I have in the drawings shown the splint-receiving pockets or notches as formed by transversely fluting, grooving, or corrugating the upper portions of the belts them-

selves, I desire it to be understood that they can instead and without departure from my invention be formed by attaching cross-strips d^2 d^2 of any desired material to the upper face
 5 of thin belts or bands, such strips being of course parallel and occupying the positions of the raised parts of the belts shown. (See Fig. 7.)

Preferably the belts are made of flexible
 10 material, as rubber or leather. If of rubber, they can be easily molded to have the desired splint-holding pockets or notches, while if of leather or other material not capable of being so molded the raised portions between and
 15 forming the sides of the pockets or notches can be, as indicated above, formed of strips of any suitable material secured to the bodies of the belts in any suitable way, so that those on one belt will be opposite the correspond-
 20 ing ones on the other in lines parallel with the splints resting in the hopper and at right angles to the line of travel of the belts.

Instead of being formed of flexible material, grooved or corrugated or provided with
 25 cross-strips, as described above, each belt may without departure from my invention be made of a series of wooden or metallic sections d^3 d^3 , (see Fig. 8,) with splint-receiving pockets or notches on their upper or outer
 30 faces hinged or jointed together to make a continuous flexible belt, which can run over the drums C C' as a sprocket-chain would.

The manner of constructing or the material of the belts is not an essential feature of my
 35 invention. All that is necessary is that they shall be flexible, so as to run over and be guided by the drums, being driven equally and uniformly by drum C , and shall have their faces, which are uppermost as they pass un-
 40 der the splints in hopper B , provided with correspondingly - arranged splint-receiving pockets or notches, into which splints can readily drop as the belts travel along under the open hopper-bottom. With the belts par-
 45 allel with, but separated from, each other, as described, each splint so received by them will be supported and held at or near its opposite ends in corresponding or opposite notches of the two belts and will be carried
 50 along out from the hopper, thus held at right angles to the travel of the belts.

In order to hold back the remaining splints in the hopper and prevent any but those seated in the belt-pockets from being carried out
 55 on the upper faces of the traveling belts, I provide an elastic clearing-roller E , preferably of rubber, which, being situated just within the rear or inner side of the hopper B , has its under side against or in close proxim-
 60 ity to the tops of the two belts, so that its rotation in the direction indicated by the arrow will sweep backward from the belt-tops any unpocketed splints. The backward rotation of this clearing-roller is made quite rapid with
 65 reference to that of roller C and the forward travel of the belts.

For driving the roller C , I provide its shaft

c with a gear-wheel C^2 , which meshes with and is driven by the gear C^3 on the shaft c^3 , upon which is fixed the band-pulley C^4 . On
 70 the shaft e of the clearing-roller E is a pinion E' , which meshes with and is driven by the gear E^2 , fixed on shaft e' , which, like shaft e , is journaled in suitable bearings supported on supplemental frame A' . Also fixed on this
 75 shaft e' or attached to gear E^2 is a pinion E^3 , which meshes with and is driven by the gear C^2 on the shaft of the drum C . The construction described will, on account of the wheel C^2 being much larger than the pinion E^3 and
 80 the gear E^2 being larger than the pinion E' on the clearing-roller, give such roller the desired rapid rotation with reference to the movement of the belts D D by the drum C . The proper
 85 tension can be given to the belts D D by movement of the supplemental frames A' A^2 toward or from each other on the main frame in the manner indicated hereinbefore.

Journaled in the rear part of the main frame away from the hopper and the drums
 90 c' c' is the shaft F , carrying the band wheel or pulley F' , to be driven by suitable connections from any desired motor or source of power. Such shaft also carries fixed to it the
 95 band-pulley F^2 and the gear-wheel F^3 , which latter meshes with and drives the gear-wheel G on shaft G' , journaled on the main frame to the rear of and above the shaft F . Fixed
 100 on shaft G' , so as to turn it and the wheel G , is the band-pulley G^2 . A band or belt F^4 runs over and connects the pulleys F^2 and c^4 , so as to drive the shaft c^3 from the driving-shaft F , to which the power is applied. The tension of
 105 this band or belt can be regulated by the described adjustment of supplemental frame A' , hereinbefore described. Pivoted upon shaft G' is the swinging arm H , which, extending forward over the frame A , has on its
 110 forward end a rotary spindle H' , journaled in suitable bearings h in the arm and having fixed on it a band or belt pulley H^2 , which is connected with and driven from pulley G^2 on
 115 shaft G' by the band or belt G^3 . Such spindle has a small winding drum or roller H^3 removably fixed upon it, so that it will revolve with but can be readily removed there-
 120 from, as desired. For this purpose a simple and efficient connection between the drum and spindle is one consisting of a spline or rib h' on the latter engaging a groove in the
 125 former.

Upon a stud or spindle H^4 on the part h^2 of arm h is a roll of tape or strip of webbing H^5 . From such roll the tape or strip runs forward
 130 under guide h^3 , roller K , and guide h^4 , and then up between the two belts D D over the front and upper sides of drum c' to the winding drum or roller H^3 , upon which its end is wound. In the machine which is shown in the drawings and described in the specifica-
 135 tion the point where this tape H^5 passes up and outward between the two belts D D is forward of and beyond the point where such belts pass through and receive the splints

from the hopper. With this construction, in which the tape H^5 does not pass between the belts where they move through the hopper, there is no danger of the tape interfering in any way with the proper seating of the splints from the hopper in the notches or pockets of the belts.

The roller K is journaled on a stud on a swinging arm K' , which is pivoted upon a shaft k , fixed in the frame A , and has its free end connected with a weight K^2 by cord or chain K^3 . Over pulley K^4 , which is journaled on shaft k , and pulley K^5 , which is attached to shaft k' , journaled in suitable bearings, runs the belt or band K^6 , of leather, rubber, or other material having a good frictional surface. A gear-wheel K^7 , connected with pulley K^5 so as to drive the same, is itself driven by the gear-wheel c^2 on the shaft c of drum C . The roller K , being above the tape or strip of webbing H^5 and the friction belt or band K^6 , where the latter runs between pulleys K^4 and K^5 , forces said tape or strip down into close contact with such band as the weight K^2 draws the arm K' downward, so that the travel of the band K^6 will help to unwind the tape or strip from its coil. At the same time the friction between the under side of the tape or strip and the band K^6 , caused by the pressure of the roller K , offers resistance to the winding of the tape or strip upon the winding-drum, so as to produce the tension necessary to secure a tight coiling of the tape or strip over the splints. Should the tension tend to become too great, the roller and arm K' will be raised against the stress of the weight K^2 , so as to diminish the friction between the tape and friction-band.

Where it is desired to connect two lengths of the coiling tape or strip together, I contemplate using a coupling such as that shown in Fig. 6, consisting of two clips $h^5 h^5$ on the tape ends, one having a tongue h^6 and the other the two ears $h^7 h^7$ to receive the tongue between them and a pin h^8 , passing through the tongue and ears. On a second fixed spindle or stud H^6 on arm H is another roll of tape or webbing-strip L , which, passing forward from the roll, is wound upon the winding-drum H^3 with the other tape H^5 , so that one overlies the other in such way as to hold securely any splints that may be inserted between them as they are being rolled or coiled up by the rotation of the drum H^3 . In order that the rate of such rotation may vary as the diameter of the coil on the drum increases, so that the rate of travel of the tapes or strips may not be increased, I make the belt G^3 and the surface of pulley H^2 of such nature that the former can slip on the latter and will drive it frictionally, the amount of friction being sufficient to apply the desired amount of rotative power to the spindle H' and drum H^3 thereon required to overcome the friction put on the tape or strip H^5 by the tension devices already described and wind both tapes from their rolls upon the drum.

The operation of my machine, which will be understood from the foregoing description and the drawings, is, briefly, as follows: As the drum C revolves the two endless belts D are carried through under the mass of splints in the hopper, so that such splints will drop into and be held in their pockets or notches $d' d'$. Continued motion of the belts carries the splints so held on out of the hopper, while the elastic clearing-roller, revolving rapidly over the tops of the belts, sweeps back all such splints as have not become seated in the belt pockets or notches and serves to straighten and fully seat any splints which, coming over vacant pockets, may not have become fairly seated therein. As the splints, with their opposite end portions held in the corresponding receptacles or pockets therefor in the two belts, are carried farther on toward the belt-drum C' they come over the tape or strip H^5 where it passes up over said drum to the outer side of the winding-drum H^3 , and are by the upwardly and outwardly inclined parts of such strip lifted easily clear of the belt notches or pockets $d' d'$, in which they have been held. As the splints are carried in under the winding-drum H^3 they pass between the converging portions of the two coiling strips or tapes H^5 and L and are gripped between the two as the latter are wound on said drum. A bundle of splints held between the tapes will thus be formed, in which the splints, which are longer than the tapes are wide, being held securely by their middle portions, will have their ends projecting at opposite sides and situated at sufficient distances from each other to enable the desired igniting composition to be applied, by dipping or otherwise, without the danger of the composition on adjoining heads being in contact or becoming stuck together.

The operation of the machine when once started will be a continuous one, the splints being fed out uniformly and continuously from the hopper to the tapes, and the coiling of the latter, with the splints between them, going on regularly until the coil or bundle on drum H^3 is made sufficiently large. The operation of the machine can then be stopped and the bundle can be removed by drawing it out, so as to slide the coiling-drum off of its rotating spindle H' , and another drum can be put on the spindle and have the remaining tape ends fastened to or wound upon it ready for the making of another bundle.

The described frictional connection between the pulley on the spindle and the means for driving it allows such spindle to be turned as desired in securing the tape ends without operation of the rest of the machine, besides allowing for slip to compensate for the variation in the diameter of the coil during a bundling operation and prevent the increase in rate of coiling up of the belts, which would ensue from the increasing of the circumference of the coil were the spindle H' always driven at the same speed.

The bundles or coils of splints and tapes as produced by my machine have the splints most uniformly placed and held between the tapes ready for the application of the igniting composition to their opposite ends by dipping or otherwise.

With the splints fed out of the hopper by the flexible endless belts with their splint-receiving pockets or notches and carried thereby in a line directly toward the point where the two tapes or coiling-strips approach each other at an angle I secure not only a most regular and uniform feed of the splints, but the most easy and free removal of the latter from the belts by the coiling tapes or strips.

Having thus described my invention, what I claim is—

1. In a machine for bundling match-splints, in combination with a hopper for the splints, two parallel feeders with traveling pocketed surfaces to take the splints from the hopper, means for moving the feeders, a flexible coiling tape or strip passing between the two feeders, but not between them where they pass beneath the hopper, and then outward past the line of travel of the splints in the pockets of the latter, a guiding-surface to support the tape or strip at or near the point where it crosses the path of the splints in the feeder-pockets, such guiding-surface being situated between the feeders, at a point beyond where they pass through, and means for coiling up the tape or strip, with the splints thereon, substantially as and for the purpose shown.

2. In a machine for bundling match-splints, in combination with a hopper for the splints, the two feeders with traveling pocketed surfaces to take the splints from the hopper, means for actuating the feeders, a flexible coiling tape or strip passing from a suitable source of supply up between the two feeders, but not between them where they pass beneath the hopper, and then outward, beyond the feeders, a rotary drum between the two feeders, forward of the hopper, to guide and support the coiling tape or strip where it passes outward between the feeders, and a rotary piece to coil up the tape or strip with the splints thereon, substantially as and for the purpose set forth.

3. In a machine for bundling match-splints, in combination with the hopper for holding the splints, the two parallel feeding devices with pocketed traveling surfaces, passing under the hopper so as to receive and take the splints therefrom, a flexible coiling tape or strip passing from a suitable source of supply between the feeding devices at a point beyond the hopper, but not between them where they pass beneath the hopper, a positively-driven drum over which the tape or strip passes on its way out from between the feeding devices, situated between such devices, forward of the point where they pass from the hopper, and a suitable revolving coiler upon which the tape or strip bearing

the splints taken from the feeding devices, is coiled, substantially as and for the purpose described.

4. In a machine for bundling match-splints, in combination with a source of supply of the splints, two parallel pocketed endless belts running over suitable supporting and driving rollers, and receiving the splints from the source of supply in their pockets, a traveling flexible strip passing outward from between the belts, but not between them where they pass beneath the source of supply of splints, so as to receive the splints from the pockets of the belts and carry them away from the same, and a rotating guide and support, up over which such strip passes on its way from between the pocketed belts, situated between such belts, where they pass over the outer roller toward which they travel from the source of supply of splints, substantially as and for the purpose specified.

5. In a machine for bundling match-splints, in combination with a source of supply of the splints, two parallel endless belts upon which the splints are supported and carried forward, traveling over suitable supporting-rollers, a coiling-tape passing upward and outward from between the belts, (but not between them where they pass beneath the source of supply of splints), over a rotating guide and support, revolving on an axis in line with that of the travel of the belts around the outer support, to which they pass from the hopper, so as to take the splints therefrom, a second tape passing over the first one, to hold the splints upon the latter, and means for coiling up the two tapes with the splints between them, substantially as and for the purpose specified.

6. In a match-splint-bundling machine, in combination with the hopper for the splints, having an opening in its lower part, the two rotary drums, the two parallel belts, having splint-receiving pockets or notches, passing over the drums and past the opening in the hopper, so as to be in contact with the body of the splints in the latter, a coiling-tape passing between the belts, (but not between them where they pass beneath the hopper), and up over the drum toward which the belts travel from the hopper, and means for coiling up such tape situated above such drum, substantially as and for the purpose shown.

7. In a match-splint-bundling machine, in combination with the hopper for the splints having an opening toward which the splints are moved in the hopper, the two rotary drums, the two parallel belts passing over the latter and past the hopper-opening, having their outer faces provided with splint-receiving pockets or notches, a rotary coiling device, over the outer drum, toward which the belts travel from the hopper, a coiling-tape passing up between the belts and over the outer drum to the winding device, but not between the belts where they pass beneath the hopper, and a second tape or strip passing

down from above the belts, and wound upon the winding device so as to receive and hold the splints from the belts between it and the first tape, substantially as and for the purposes set forth.

8. In a match-splint-bundling machine, in combination with the hopper for the splints, having an opening in its bottom, a rotary drum below such opening, an outer drum beyond the hopper, parallel to the first one, two parallel belts running over the two drums, having their outer faces adapted to come in contact with the splints at the opening in the hopper, provided with splint-receiving pockets or notches, a rotary coiling-drum over the outer belt-drum, and the two splint receiving and holding tapes coiled upon the coiling-drum, one passing to the drum between the belts, (but not between them where they pass beneath the hopper) and, around and over the outer belt-drum, and the other passing downward and outward under the coiling-drum, but over the first tape, substantially as and for the purpose described.

9. In a match-splint-bundling machine, in combination with two rotary drums, the two parallel belts running over the same, having their outer faces provided with splint-receiving pockets or notches, a bundling-tape passing up between the belts, but not between them where they pass beneath the splint-feeding means, and then over the outer belt-drum, and then upward at an angle to the belts, so as to take the splints therefrom, and means

for coiling up such tape, with the splints thereon, substantially as and for the purpose specified.

10. In a match-splint-bundling machine, in combination with two rotary drums, the two parallel belts running over the same, having their outer faces provided with splint-receiving pockets or notches, means for feeding the splints into these pockets or notches, a rotary winding device made movable toward and from the roller toward which the belts carry the splints from the feeding device and the two coiling-tapes connected with the winding device so as to be wound thereon, as it rotates, one passing between the belts (but not between them where they pass beneath the splint-feeding means), outward over the outer belt-drum, and then up around the winding device, and the other being led from a point above the belts, outward between the winding device and the outer belt-drum, over the first tape, so that the splints taken from the belts by the latter will be clasped between the two tapes, as they are rolled or coiled up by the winding device, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 6th day of April, A. D. 1893.

CHARLES J. DONNELLY.

Witnesses:

FRANK H. MASSEY,
MAURICE R. MASSEY.