(No Model.) 3 Sheets—Sheet 1.

J. C. DONNELLY.

MATCH MAKING MACHINE.

No. 524,197. Patented Aug. 7, 1894.

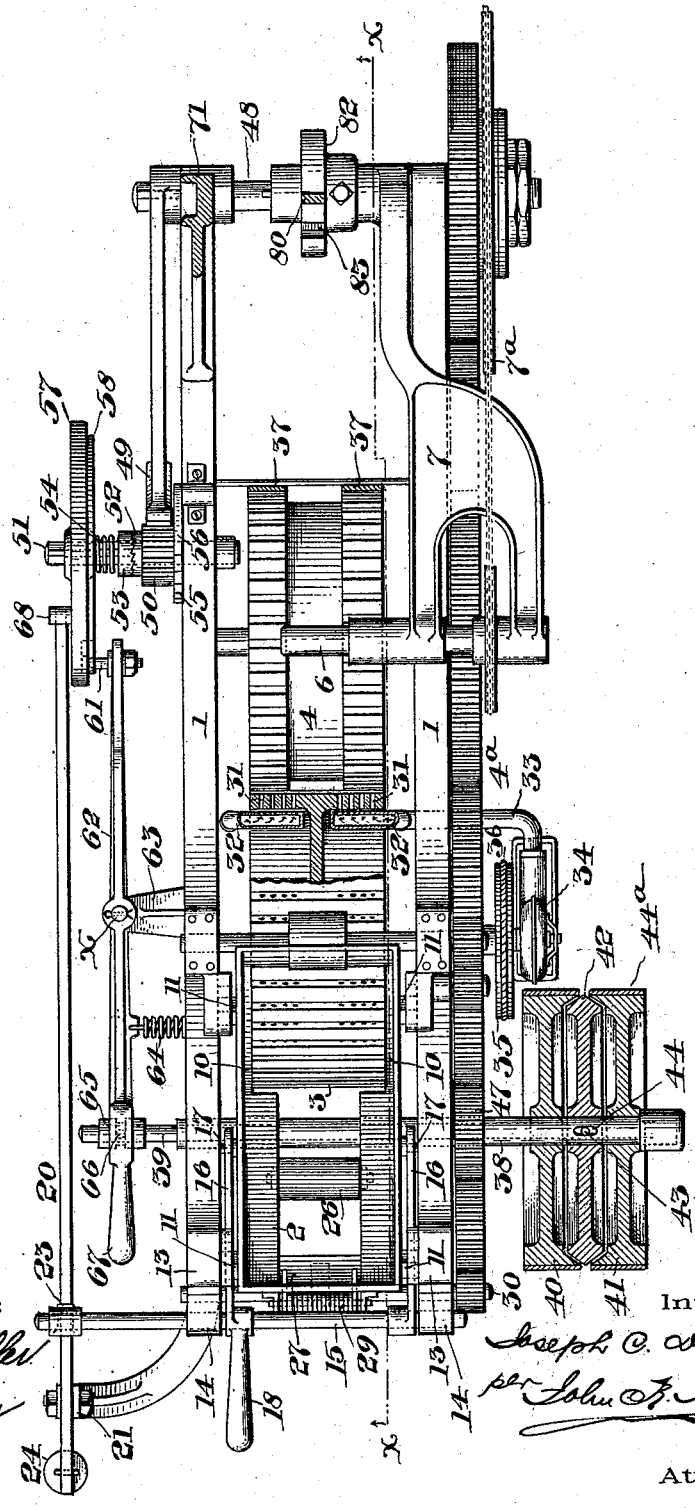

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

Fig. 5.

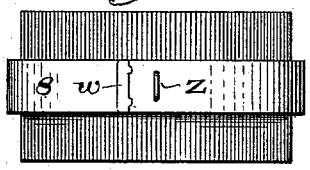

Fig. 2.

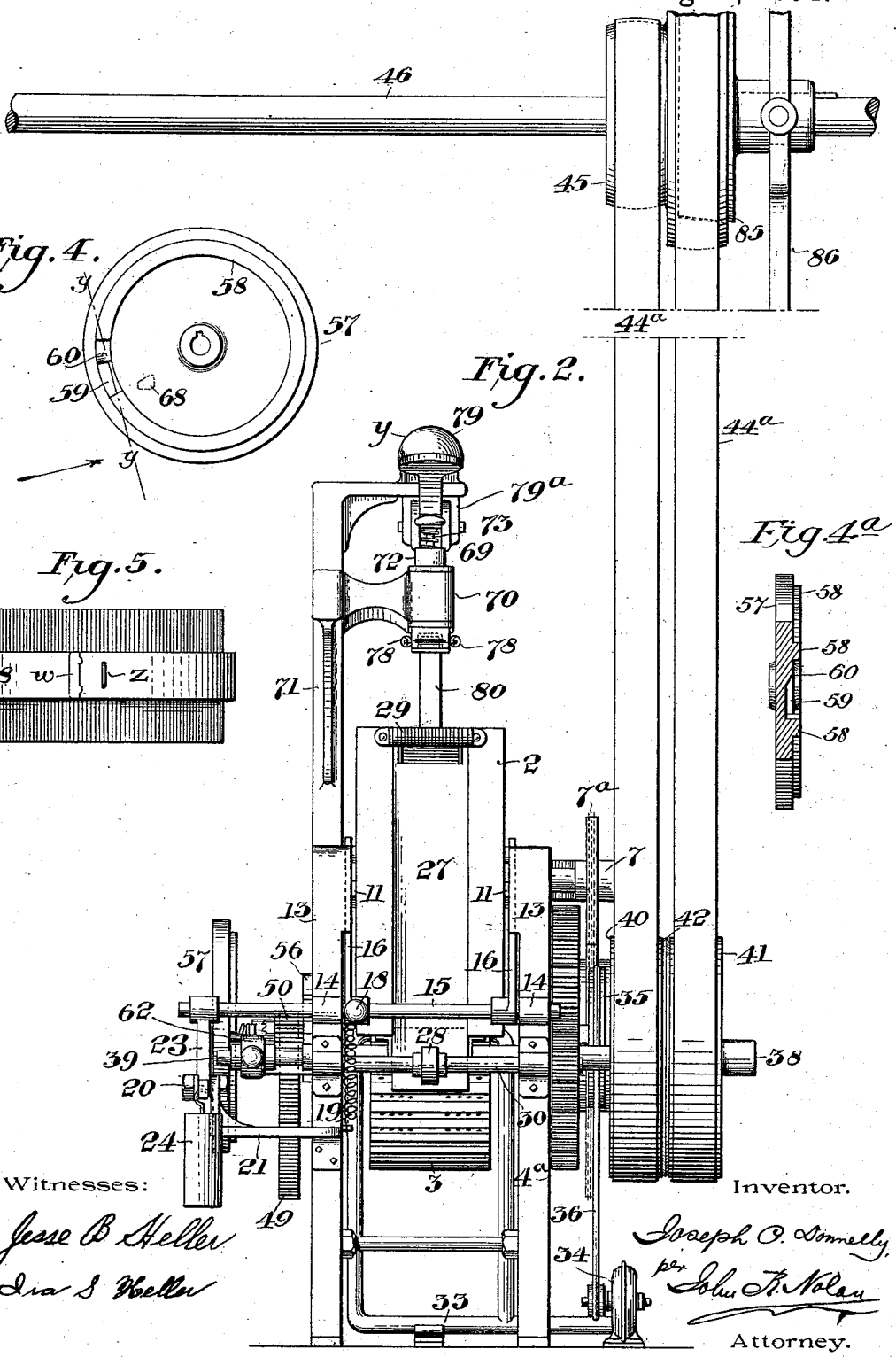

Fig. 4a

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(No Model.) 3 Sheets—Sheet 3.

J. C. DONNELLY.

MATCH MAKING MACHINE.

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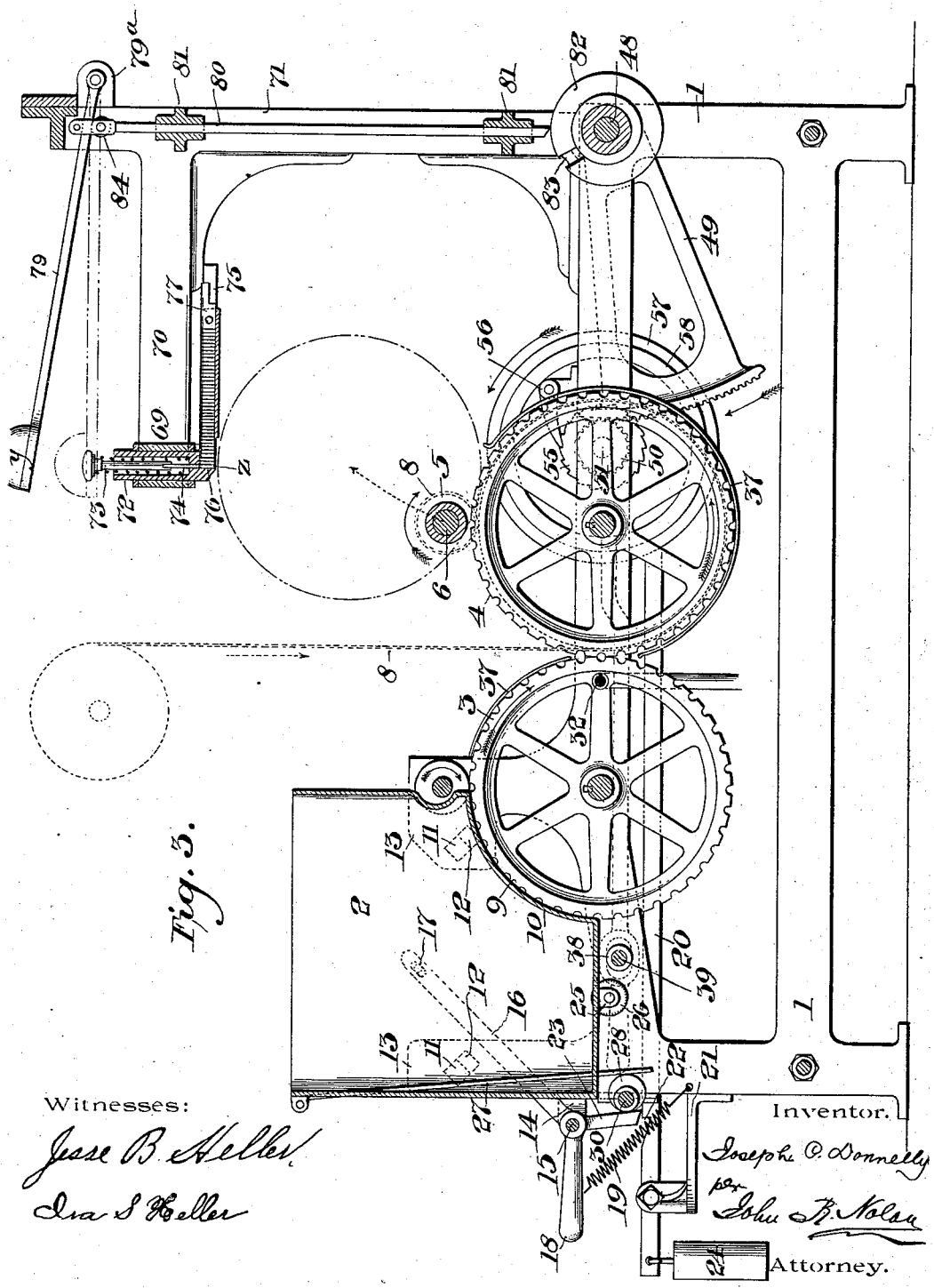

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOSEPH C. DONNELLY, OF PHILADELPHIA, PENNSYLVANIA.

MATCH-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 524,197, dated August 7, 1894.

Application filed February 8, 1894. Serial No. 499,437. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH C. DONNELLY, a citizen of the United States, residing in the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Match-Making Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in match making machines, the same being especially, though not exclusively, applicable to that class termed bunching or coiling machines wherein the match splints preparatory to their being dipped, are transferred from a feed hopper to a bunching spool by means of an interposed conveyer, such conveyer being, ordinarily, a peripherally-serrated roller, or a series of co-acting correspondingly-serrated rollers.

My improvements consist first, in a construction of the hopper and operating mechanism therefor, whereby, among other advantages, the feeding of the splints to the conveyer may be checked at predetermined intervals; secondly, to a novel means for transferring the splints from one conveyer or roller to another adjacent thereto; thirdly, in means for varying the speed of the machine during certain stages of the bunching operation; fourthly, in means for automatically applying a fastening device to the bunching web when the full complement of splints has been assembled thereby; and, finally, in various novel features of construction and arrangement of parts co-operating to produce an efficient automatic bunching machine, all as will be hereinafter fully described in detail, and be defined in the appended claims.

In the the annexed drawings, Figure 1 is a sectional plan of a machine embodying my invention. Fig. 2 is an end view thereof. Fig. 3 is a longitudinal vertical section as on the line *x*—*x* of Fig. 1. Fig. 4 is a view of the "governor wheel" detached. Fig. 4ª is a section as on the line *y*—*y* of Fig. 4. Fig. 5 is a view of a bundle of splints.

The numeral 1 marks the main supporting frame in which are supported the hopper 2, the peripherally serrated roller 3 communicating therewith, the second correspondingly-serrated roller 4 adjacent to said roller 3, and the gearing 4ª for rotating said rollers in such manner that their peripheral serrations shall successively register.

5 is the bunching spool which is suitably supported on a shaft 6 mounted on a vibratory arm 7 in reference to the roller 4.

8 is the bunching tape or web, which is passed around a median circumferential groove in said last-named roller and engaged with the bunching spool and 7ª is an appropriate sprocket gearing for rotating said spool supporting shaft relatively to the serrated rollers, whereby the match splints transferred from the hopper to the bunching spool shall be taken up and tightly wound by and between the coils of the web.

The hopper 2 is constructed with a recess 9 in the forward lower corner thereof to receive the periphery of the serrated roller 3 during the traverse of the latter, whereby the splints contained in the hopper are taken up separately by the succeeding depressions in said roller. This hopper instead of being fixed, as heretofore, in respect to the path of the roller is movable therefrom, and is provided with inwardly projecting ledges 10 that extend to, or nearly to, the respective edges of that portion of the periphery of the drum that extends within the hopper,—that is to say, these ledges are segments formed and arranged concentrically with the roller.

When the hopper is in the operative position the ledges lie below the notches or depressions in the roller 3 so that they do not interfere with the free feeding of the splints to the roller, but when the hopper is raised or moved outward the ledges are thrown outwardly from the periphery of the roller, to maintain the splints beyond the path of the latter, in which case, as is obvious, the roller turns idly in the hopper.

By moving the hopper bodily the movement of the contained splints in reference to the carrier may be effected more positively and uniformly than if the bottom of the hopper or a portion thereof were moved as heretofore, for the reason that in the latter construction the entire body of splints rests upon the movable portion of the hopper and necessitates pressure directly against the splints. Besides this, such movable portion being necessarily

unsupported laterally, is apt to be broken or displaced by the weight of the body of splints thereon.

While there is more than one way whereby the hopper may be movably supported, and whereby the requisite movements may be imparted thereto, I shall describe a construction which is efficient and desirable, as follows: Fixed on the sides of the hopper are blocks or projections 11 that are fitted to suitably inclined guide-ways 12 formed by the walls of slots in up-rising post 13, on the main frame, whereby the hopper may be reciprocated radially in respect to the adjacent roller. On the end of the frame are boxes 14 in which is journaled a rock-shaft 15 from which extend upwardly inclined arms 16 that embrace the sides of the hopper. The upper ends of these arms are connected with the respective sides of the hopper by pin and slot connections 17, or in any other way, whereby the desired movement of the hopper may be had by properly turning the rock-shaft. This shaft is provided with an operating handle 18. The hopper is preferably held normally retracted, or inactive, by means of a suitably arranged spring or weight. In the present instance I have illustrated for this purpose a retracting spring 19, one end of which is secured to the handle and the other end to the frame.

To maintain the hopper conditionally depressed, or in action against the stress of the spring, I have provided a latch device which comprises a horizontally disposed lever 20 fulcrumed on the bracket 21 extending from the main frame, and provided with a notch or shoulder 22 immediately below the rock shaft. Depending from this shaft is an arm or dog 23 against the lower end of which the lever is normally maintained by means of a weight 24 (or spring) on one end of the lever. The notch or shoulder 22 is so arranged in respect to the dog that when the rock shaft is turned to depress the hopper, the end of the dog swings above the notch, the lever arm thereupon ascending and in consequence locking the dog in the notch. The instant the arm is depressed the dog is freed from the notch and the hopper, through the action of the spring 19, is quickly retracted. I have provided means to trip the latch lever automatically at a predetermined interval during the bunching operation which means will be described in due course.

In order to insure the proper alignment of the splints in the hopper, preparatory to their being fed to the roller 3, I journal in and between a pair of depending ears 25 on the bottom of the hopper, so as to be freely revoluble, a peripherally milled roller 26, the periphery of which projects very slightly within the hopper, as shown. The splints on the bottom of the hopper, as they are agitated by the usual vibratory back 27, take against the projecting periphery of the roller and are "squared" thereby.

The means whereby the hopper back is agitated consists, in this instance, of a positively driven eccentric 28 and a torsional spring 29. The eccentric is mounted on a transverse shaft 30 that is driven by and from the lateral gear train, while the torsional spring encircles the pivot rod of the back and acts to maintain the latter yieldingly against the eccentric. Hence during the rotation of the eccentric a rapid vibration of the hopper back is effected. This construction, as will be observed, does not interfere with the bodily reciprocation of the hopper above described.

The roller 3 as above stated is formed with transverse notches in its periphery, which are designed to receive the splints contained in the hopper and convey them successively to or opposite to corresponding notches in the adjoining roller 4, whence they are conducted to the bunching coil. Ordinarily the splints are transferred from the first to the second roller by means of a curved finger or stripper device that is interposed between the two rollers, which device, however, owing to the fragility of the splints and the nature of the work to be performed requires nice fitting and adjustment, otherwise good results cannot be had. To obviate the necessity of using this stripper device, I provide the roller 3, in each of its peripheral notches, with a series of perforations 31, whereby, upon each splint being advanced in proximity to the notch of the roller 4, a blast of air may be blown through the perforations rearward of the particular splint to impel the splint with precision to such proximate notch.

It being obvious that the air blast may be directed to the perforations in various ways, I do not restrict myself to the particular means illustrated for this purpose, although I would remark that that means is very efficient and desirable. As shown, it comprises two laterally-perforated tube sections 32, arranged within the roller 3 to extend parallel with, and rearward of, each series of peripheral perforations when the latter are opposite a notch of the roller 4. The orifices in the sections are directed toward the rim of the roller, and they are of the same number and relative arrangement as the series of perforations in each notch of the roller. These sections are connected with a common pipe 33, that is, in turn, connected with the discharge nozzle of a fan 34 or other air blast engine. In the present instance the fan is driven from a pulley 35 on the end of the shaft of roller 3 by means of a belt 36. By this construction it will be evident that while the machine is in operation, the air blast, generated by the fan, will be forced through the orifices in the pipe sections, thereupon, as the notches of the roller successively register with those of the roller 4, effecting the requisite transference of the splints.

Disposed adjacent to the rollers, in proximity to the path traversed by the splints during their transmission from the hopper to the bunching coil, are the usual curved guard

plates 37 that are intended to prevent the splints from accidentally falling from their grooves.

The bunching tape or web 8, as before mentioned, is passed around a median circumferential groove in the roller 4, and is connected with the rotatable spool 5. In practice, the spool, at the outset, makes several revolutions preparatory to the delivery of the splints to the coil, whereupon the splints are delivered and the winding thereof continued until the coil has reached a proper size. This done, the feeding of the splints is arrested while the remainder of the web is wound around the coil, at the completion of which a staple, tack, or other fastening device, is driven by the attendant in the free end of the web to secure the latter.

A feature of my invention consists in the provision of automatic mechanisms whereby when the desired complement of splints has been wound, the splint feeding operation will be arrested; the remainder of the web will be wound with rapidity; the winding operation will be checked, and the fastener will be inserted; which mechanisms I shall now proceed to describe as follows:

38 designates a hollow shaft mounted in suitable bearings in the main supporting frame, through which shaft extends a longitudinally movable shaft 39. On the hollow shaft are loosely supported the two sections 40, 41 of a variable speed friction pulley between the opposed beveled faces of which sections is interposed a clutch member 42. This clutch member is splined to the shaft 38, so as to be movable to and from the opposed face of either of the pulley sections, and it is connected with the inner shaft by means of a pin 43 which extends through a slot 44 in the hollow shaft. Hence by properly moving the inner shaft, the clutch member may be engaged with either of the loose pulley sections or be disengaged from both. The pulley sections are driven by suitable belting 44^a from a cone pulley 45 on an upper power driven shaft 46, which cone pulley is designed to impel the pulley section 40 at a normal speed and the other section 41 at a higher rate of speed. Consequently, when the clutch member is engaged with either of the pulley sections, the shaft is driven at a normal or fast speed as the case may be.

Variable speed mechanism of this particular description is not new *per se*. In fact, there are other known constructions that may be used equally well in lieu thereof.

On the shaft 38 is keyed the pinion 47, which, co-acting with the gear train of the several parts, transmits the motion thereto.

On one end of the rocking shaft 48 to which is keyed the arm 7, that supports the bunching spool and its adjuncts, is fixedly secured a forwardly-extending toothed sector 49, the teeth of which mesh with those of a pinion 50. This pinion is freely supported on a revoluble stud 51 that projects outward from the side of the frame work, and in this instance its diameter in reference to the face of the segment is such that a complete stroke of the latter will rotate the pinion one revolution. By a complete stroke of the sector is meant its traverse or upward movement by the rising of the arm 7 during the coiling of the web or tape upon the bunching spool.

On the face of the pinion is a toothed clutch member 52 with which a similarly toothed member 53 is held normally engaged by the action of a spring 54, this latter member being splined to the shaft. The teeth of the clutch members are so disposed that during the upward traverse of the sector, the pinion during its rotation correspondingly rotates the spring-actuated member 53, and, perforce, the stud; but that during its downward traverse the pinion is rotated freely without affecting the shaft.

The shaft is provided with a ratchet wheel 55, with which engages a pawl 56 the function of which is to prevent backward movement of the shaft. Fast on this shaft, near its outer end, is a wheel 57, which I term the "governor wheel." On one face of this wheel is formed or secured a concentric circular track 58 that is interrupted at a suitable part of its periphery by a depressed portion 59, which depressed portion is provided with an inclined or raised part 60.

Bearing against the track is a stud 61 on the free end of a horizontally-disposed lever 62 that is fulcrumed, at x, to a bracket 63 extending from the adjacent side of the main frame. This stud is held yieldingly against the track by means of a retracting spring 64 secured to the forward arm of the lever and to the said frame. This arm is connected with the shaft 39, in any suitable manner whereby the position of the lever will control that of the shaft as will presently appear. In the present instance the forward lever arm is slotted to embrace a circumferentially grooved collar 65 on the projecting end of the shaft 39, a pin 66 on the arm engaging the groove in the collar. This arm is provided with a handle 67 whereby the lever may be operated by an attendant.

The parts are so constructed and organized that while the pin is bearing upon the raised portion 58 of the track, the shaft 39 is sufficiently retracted to maintain the clutch member 42 in action with the normal speed pulley section 40; when the pin is bearing upon the deeper face of the depressed portion of the track, immediately following the plane part, the shaft is projected to maintain such clutch member in engagement with the fast speed pulley section 41, and when the pin is bearing upon the raised face of the depressed portion of the track the shaft is in the intermediate position to maintain the clutch member idly between the two pulley sections.

On the outer face of the wheel 57 is a tappet pin 68, into the path of which projects the latch lever 20, hereinbefore described in con-

nection with the hopper, which pin at a prescribed period during the revolution of the wheel is adapted to abut against said lever and thereby free the hopper to check the feeding of the splints to the machine.

When the machine is at rest the hopper occupies the raised position above described, the stud on the lever 62 being engaged with the intermediate face 60 of the track.

Preparatory to the bunching operation the operator pulls outwardly the handle of the lever 62 thereby throwing the clutch member 42 into engagement with the pulley section 40, and, perforce, starting the machine. The bunching spool, with the end of the web secured thereto, having been mounted on the shaft 6, the spool, during its rotation, winds the web thereon. During such winding the arm 7 is moved gradually upward, thereby correspondingly moving the sector 49, which, in turn, actuates the pinion 50, its stud 51, and the wheel 57. When the requisite initial winding of the web has been effected, the operator releases the lever handle, whereupon the stud 61 takes against the projecting face of the track, which at this stage has advanced in front of the stud, said track thereby maintaining the machine in operation, as above mentioned. He then raises the handle 18 on the rock shaft 15, so as to depress the hopper and thus to permit the feeding of the splints to the machine, the depending dog 23 thereupon entering the recess in the latch lever and being locked therein. This being done, the splints are conveyed to the bunching web as previously set forth and the winding thereof carried on until the coil has assumed proper proportions. At this juncture the depressed portion of the track 58 which has been steadily advancing, reaches the stud 61 of the lever 62, whereupon the spring 64 retracts the forward arm of the lever in a manner to throw the clutch member into engagement with the speed pulley section, and at the same time the tappet pin 68 strikes the latch lever 20 and releases the hopper, which latter, springing upward, checks the feeding of the splints to the machine. Hence the bunching spool runs at a high rate of speed and winds up quickly and tightly upon the coil the remainder of the web. When this has been accomplished the portion 60 of the track has been advanced in front of the stud on the lever 62, thereupon arresting the operation of the machine.

The fastener device, hereinbefore referred to, that is brought into action when the web has been wound up, is of the following construction: 69 designates a staple driver which occupies a position directly above the center of the completed coil and adjacent to the periphery of the latter, being held in that location by an overhanging arm 70 extending from an upright 71 that is bolted or otherwise secured to the main supporting frame. This staple driver, comprises a vertically disposed casing 72, a spring elevated plunger 73 therein, provided on its lower end with a blade 74, and a horizontally disposed staple holding bar 75 extending rearwardly from the plunger case and communicating with the space 76 in the plunger case traversed by the blade 74.

77 is a follower that embraces the staple bar, rearward of the staples, and acts yieldingly against the latter to feed them forward, there being provided laterally disposed retracting springs 78 that tend to draw forward the follower. Thus when the plunger is elevated a staple *z* lies immediately beneath the blade 74 so that a sharp blow upon the head of the plunger will effect the driving of such staple into the substance beneath. Upon the elevation of the plunger the leading staple on the bar is fed beneath the plunger blade by the follower, in readiness for another operation, the feeding of the successive staples on the bar being effected in like manner.

Staple drivers being, in themselves, well known, it is thought that the above brief description thereof will suffice. In this connection I would add that the construction of the staple driver is immaterial so far as this feature of my invention is concerned. In fact, if desired, any automatic tack or nail driving device may be substituted for the staple inserting mechanism.

Extending over and above the head of the plunger is the free end of a lever 79, the other end thereof being pivoted to a bracket 79ª supported by the upright 71. The free end of the lever is weighted, as at *y*, for a purpose below described. Embracing the lever just forward of its fulcrum is the forked upper end of a vertically-movable rod 80 which is supported in guide arms 81 extending from the upright, whereby, when said rod is raised, the lever will be elevated, and the converse.

Fixed on the boss of the swinging arm 7, or integral therewith, if desired, is a collar 82 which is provided at a suitable point in its periphery with a notch or recess 83. This collar is of such diameter that when the rod is resting upon its periphery, the lever is maintained in the elevated position shown in Fig. 3, but the instant the notch or recess is advanced below the rod, the weighted end of the lever being unsupported, drops sharply upon the head of the plunger 73, and, in consequence, drives the staple (or other fastener) into the coil beneath.

The forked portion of the rod is preferably equipped with an anti-friction roller 84 upon which the lever bears.

The collar is so arranged relatively to the arm 7 that the rod 80 rests upon the collar's periphery when the spool, with its attached web, is first applied to the winding shaft of said arm, and remains on said periphery until the web has been almost completely wound up and the operation of the machine is on the point of being arrested as hereinbefore described, whereupon the notch or recess in

the collar having been gradually advanced, reaches the rod, and, in consequence, the rod drops, as above recited, and effects, through the intermediate devices, the insertion of a staple (or tack) in the coil. When the coil is removed from the machine, the rod 80 being interlocked with the collar, prevents the arm 7 from descending until the rod and the lever 79 are raised. Thus the winding shaft on the arm is temporarily held up in convenient position to receive another bunching spool.

In order that the operation of the machine may be stopped at any time during the bunching period, should occasion require it, without any liability of disconcerting the "governor wheel," I mount the pulley 45 loosely on its shaft 46 and provide the latter with a suitable clutch 85 that may be readily engaged with or disengaged from said pulley. In the present instance this clutch is a tapered wheel splined to the shaft and adapted to engage the correspondingly tapered portion of the pulley 45, a suitable lever 86 being provided to facilitate the requisite movements of the clutch wheel. *w* is simply a metallic clip applied to the end of the bunching tape or web to prevent the fraying of the latter.

I claim as my invention—

1. The combination, with the continuously moving splint carrier and mechanism for operating the same, of a movable splint feeding hopper therefor provided with ledges or flanges adjacent to said carrier, a rock shaft arms thereon connected with said hopper, and lateral supports adapted to guide the hopper radially in respect to the carrier, whereby the said ledges or flanges may be moved below the carrying surface to permit the removal by the latter of the splints from the hopper, or be moved above such surface to prevent their removal substantially as described.

2. The combination, with the splint carrier, of a movable splint feeding hopper therefor provided with ledges or flanges adjacent to said carrier, a rock-shaft and arms thereon connected with said hopper, together with means adapted to maintain said hopper normally retracted from the carrier, substantially as described.

3. The combination, with the splint carrier, of a movable splint feeding hopper therefor provided with ledges or flanges adjacent to said carrier, a rock shaft, arms thereon connected with the hopper, means for normally retracting said hopper from the carrier, a lever, and a trip connection between the same and the rock shaft, substantially as described.

4. The combination, with the splint carrier, the bunching spool and the bunching tape or web with their supporting and operating parts, of a movable splint feeding hopper provided with ledges or flanges adjacent to said carrier, a rock shaft, arms thereon connected with said hopper, means for normally retracting the hopper, a lever, a trip connection between the same and the rock shaft, and means for automatically actuating said lever when the bunching coil has reached a predetermined size, substantially as described.

5. The combination with the splint carrier, the bunching spool and the bunching tape or web with their supporting and operating parts, of a splint feeding hopper provided with splint-supporting ledges or flanges adjacent to the carrier, means whereby said hopper is normally held beyond the path of said carrier, means whereby it may be maintained in the path of the carrier, and means for automatically releasing the hopper when the bunching coil has reached a predetermined size; substantially as described.

6. The combination with the hopper, the splint carrier, the bunching spool, the vibratory supporting arm therefor, the bunching tape or web; and means for actuating said spool, of the sector connected with said arm, the pinion, its shaft or stud, a clutch connection between said shaft or stud and the pinion the governor wheel on said shaft or stud and connections intermediate the same and the hopper for arresting the feeding of the splints to the carrier at a predetermined period; substantially as described.

7. In a match making machine, the combination, with the hopper provided with an opening therein for the discharge of the match splints, and provided with a transverse opening or channel in the bottom thereof rearward of the discharge opening, of an independently revoluble roller transversely mounted below said hopper in such manner that its periphery projects slightly into the hopper through said rearward opening or channel, and means rearward of, and separate from, said roller for agitating the splints contained in the hopper, substantially as described.

8. In a match making machine the combination with two serrated co-acting splint carriers, one of which is provided with perforations or openings in the grooves of the serrations, of a blast device arranged within said perforated carrier and adapted during the traverse thereof to transfer the splints in the successively advancing grooves of that carrier to the registering groove of the adjacent carrier; substantially as described.

9. In a match making machine, the combination with two peripherally serrated splint carrying rollers and means for concertedly rotating the same, one of which rollers is provided with perforations or openings in the grooves of the serrations, of a perforated tube arranged within said perforated roller and a fan or air blast engine connected with said tube, whereby the splints in the successively advancing grooves of the perforated carrier are transferred to the registering grooves of the adjacent carrier, substantially as described.

10. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool and its co-acting tape or web,

of a driving shaft provided with a differential speed device, and means whereby a fast speed is automatically thrown into action when a predetermined number of splints has been coiled, substantially as described.

11. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool and its co-acting tape or web, of a driving shaft provided with a differential pulley thereon, a clutch therefor, and means for automatically transferring said clutch to the faster pulley section when a predetermined number of splints has been coiled; substantially as described.

12. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool and its co-acting tape or web, of a driving shaft provided with a differential speed device thereon, means whereby the feeding of the splints may be arrested, at a predetermined period and means whereby a fast speed is thrown into action at such period, substantially as described.

13. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool and its co-acting tape or web, of a hollow shaft, provided with a differential pulley thereon, the clutch therefor, an inner shaft connected with said clutch, a governor device, means for actuating the same concertedly with the bunching spool, and connections between said device and the said inner shaft, substantially as described.

14. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool, a vibratory supporting arm therefor, the bunching tape or web and means for rotating the spool, of the sector connected with said arm, the pinion, its shaft or stud, the governor wheel on said shaft or stud, the driving shaft, a differential speed device thereon, and connections intermediate said governor wheel and the differential speed device, substantially as described.

15. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool, and a co-acting bunching tape or web, of a fastener inserting device, and means for automatically actuating said device to insert a fastener in the coil when the winding of the tape or web has been completed; substantially as described.

16. In a match making machine, the combination with a hopper, a splint carrier, a bunching spool, a vibratory supporting arm therefor, a bunching tape or web, a fastener inserting device, a trip lever adjacent to the plunger thereof, a supporting rod for said plunger and means for tripping said rod when the winding of the tape or web has been completed; substantially as described.

17. In a match-making machine, the combination with a hopper, a splint carrier, a bunching spool, a vibratory supporting arm therefor, a bunching tape or web, a fastener inserting device, a trip lever adjacent to the plunger thereof, a supporting rod for said plunger, a notched collar or support connected with the vibratory arm and adapted to sustain said rod during the winding of the tape or web and to trip said rod at the completion of the winding operation, substantially as described.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

JOSEPH C. DONNELLY.

Witnesses:
JOHN R. NOLAN,
JESSE B. HELLER.