(No Model.) 5 Sheets—Sheet 1.

W. G. ALLEN.

MACHINE FOR MAKING METAL SPOKES.

No. 605,050. Patented May 31, 1898.

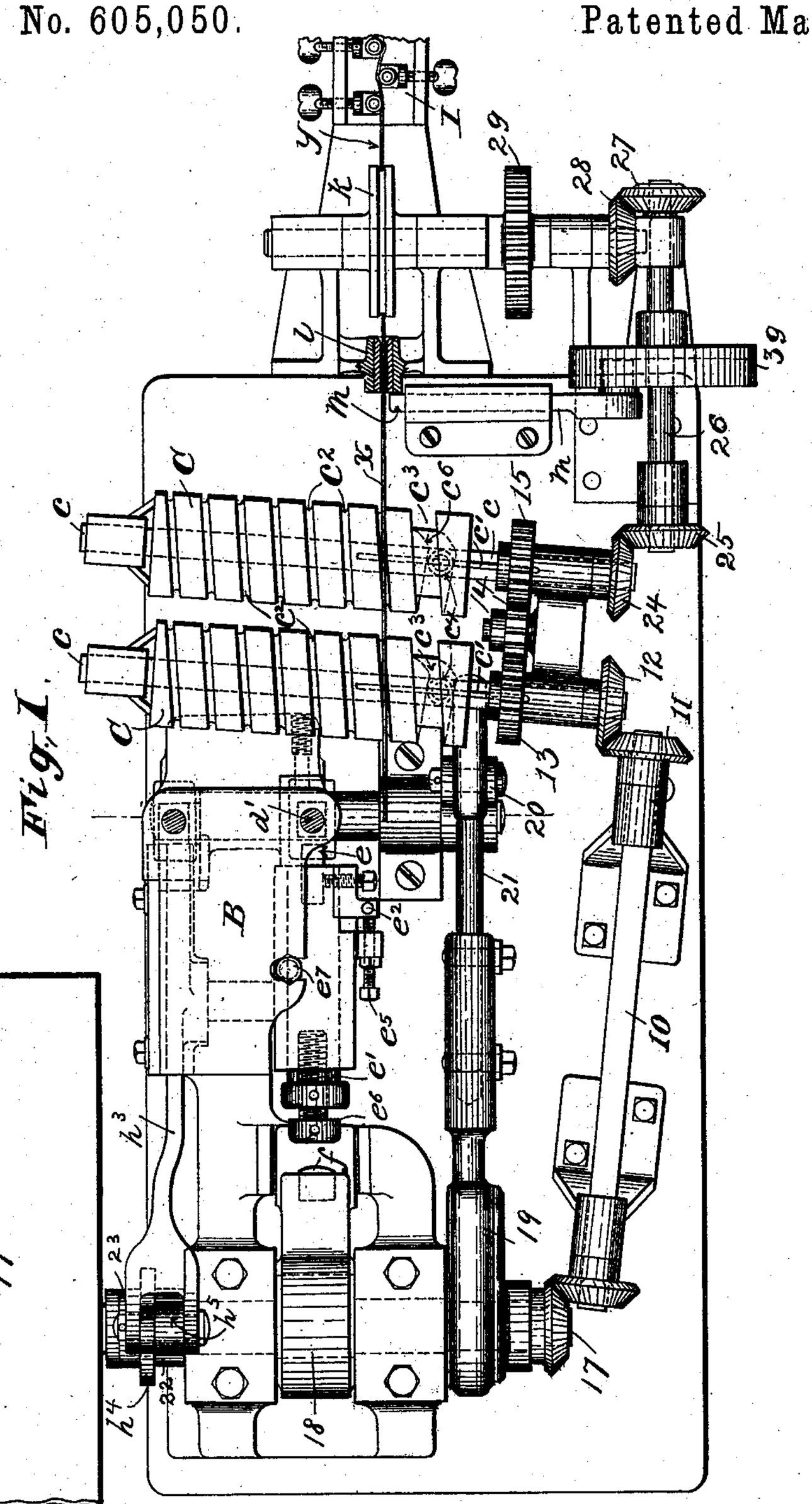

Fig. 1.

Witnesses.
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his attorneys

(No Model.) 5 Sheets—Sheet 2.

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Fig. 2.

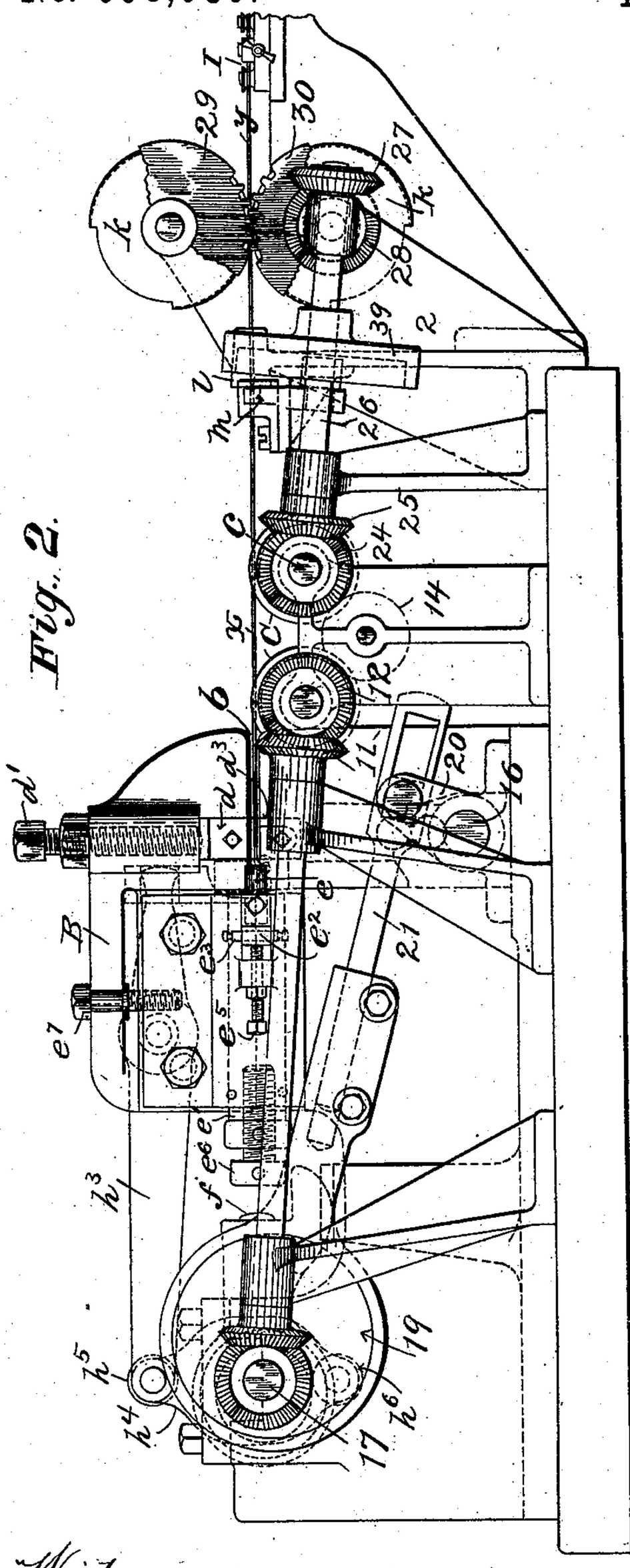
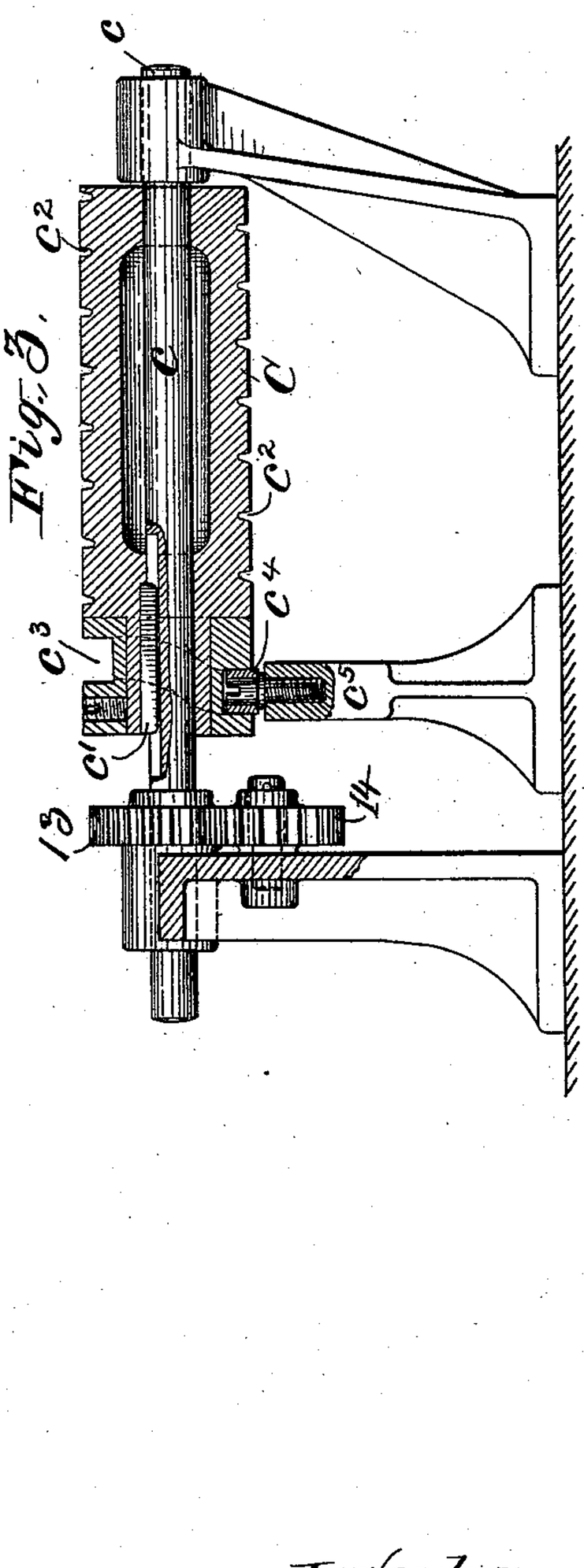


Fig. 3.



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(No Model.) 5 Sheets—Sheet 3.

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Fig. 5.

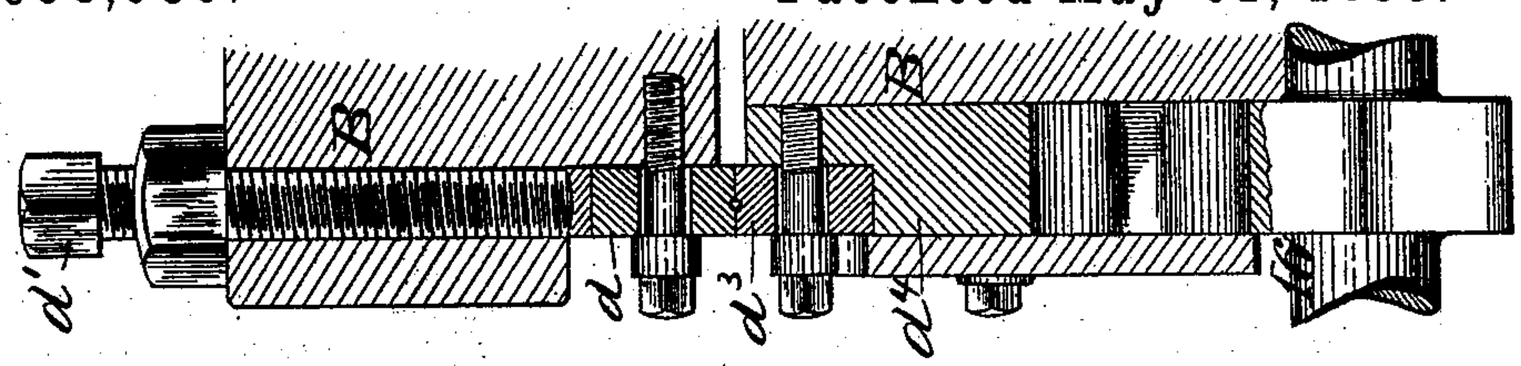
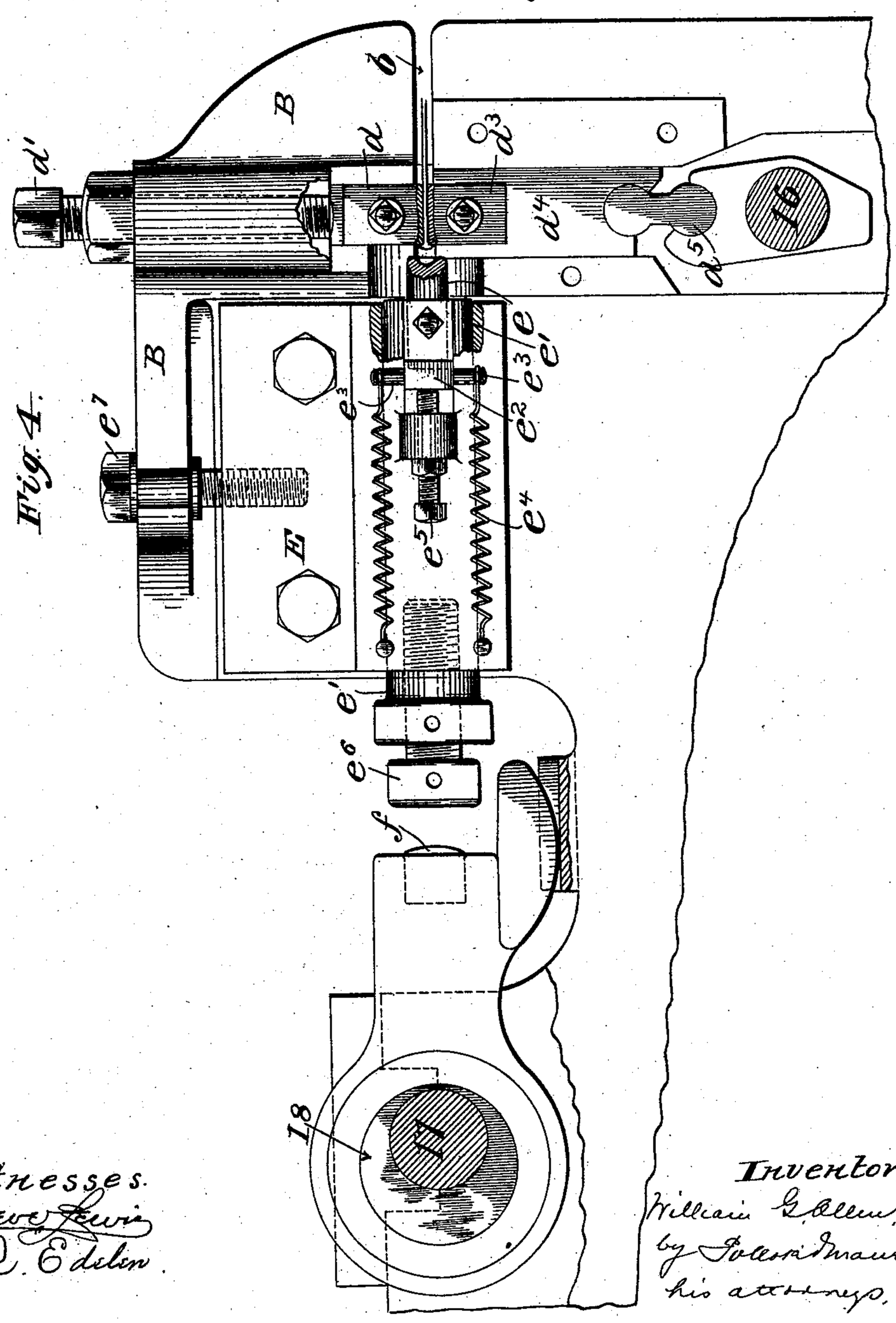


Fig. 4.



Witnesses.
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(No Model.) 5 Sheets—Sheet 4.

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MACHINE FOR MAKING METAL SPOKES.

No. 605,050. Patented May 31, 1898.

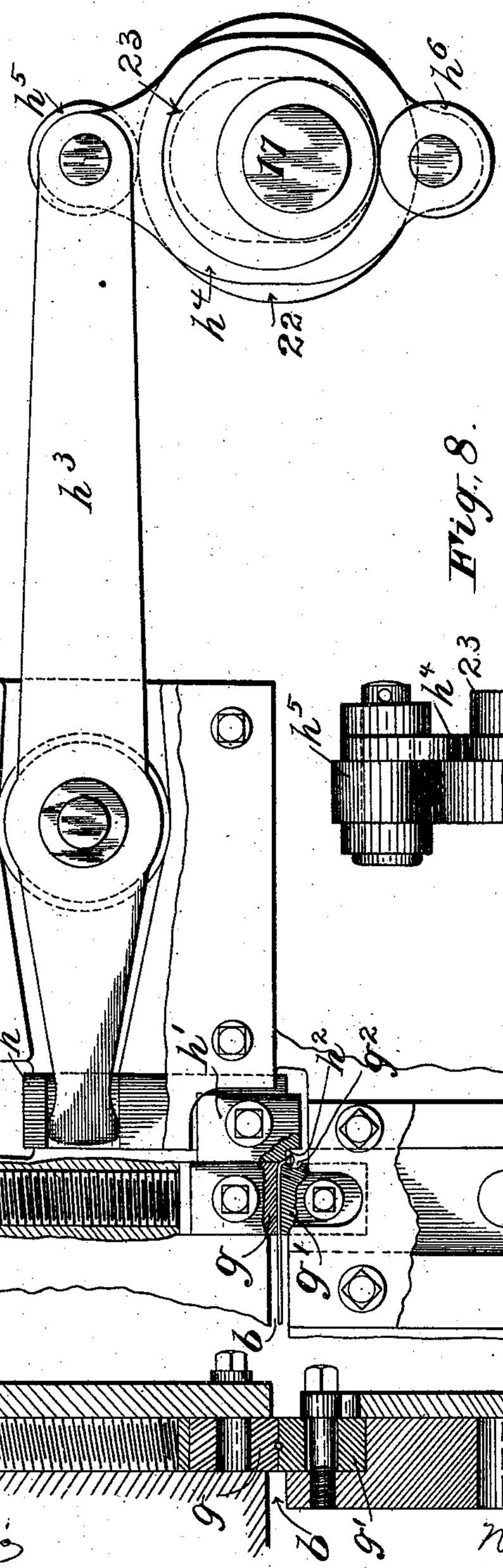

Fig. 6.

Fig. 8.

Witnesses
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(No Model.) 5 Sheets—Sheet 5.

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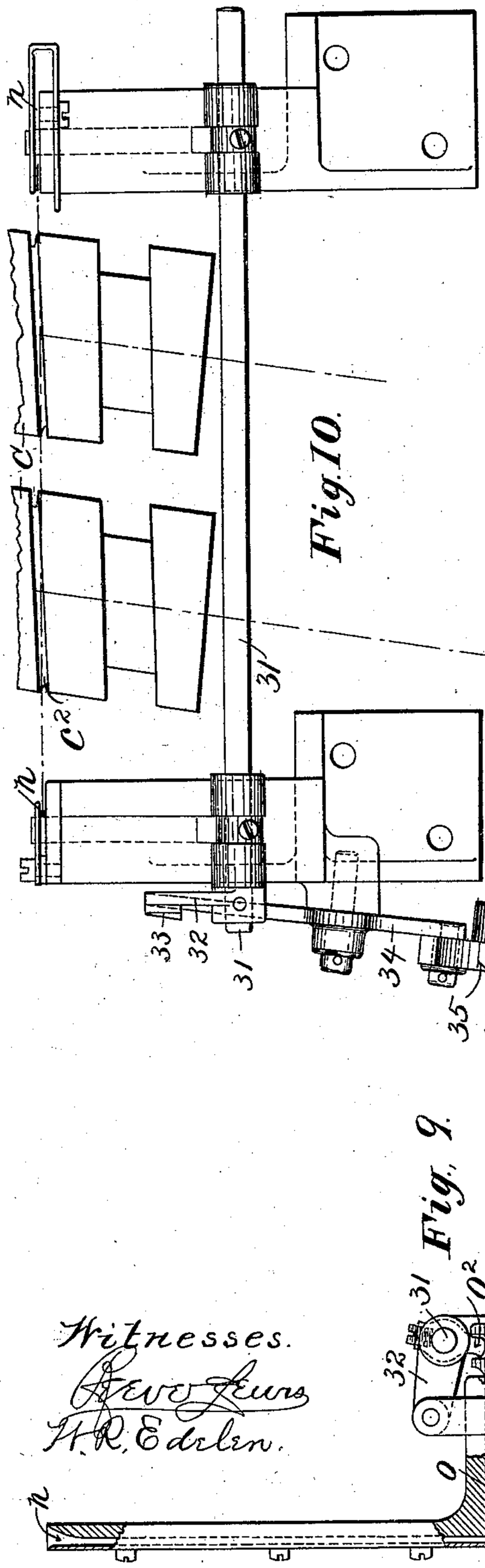

Fig. 10.

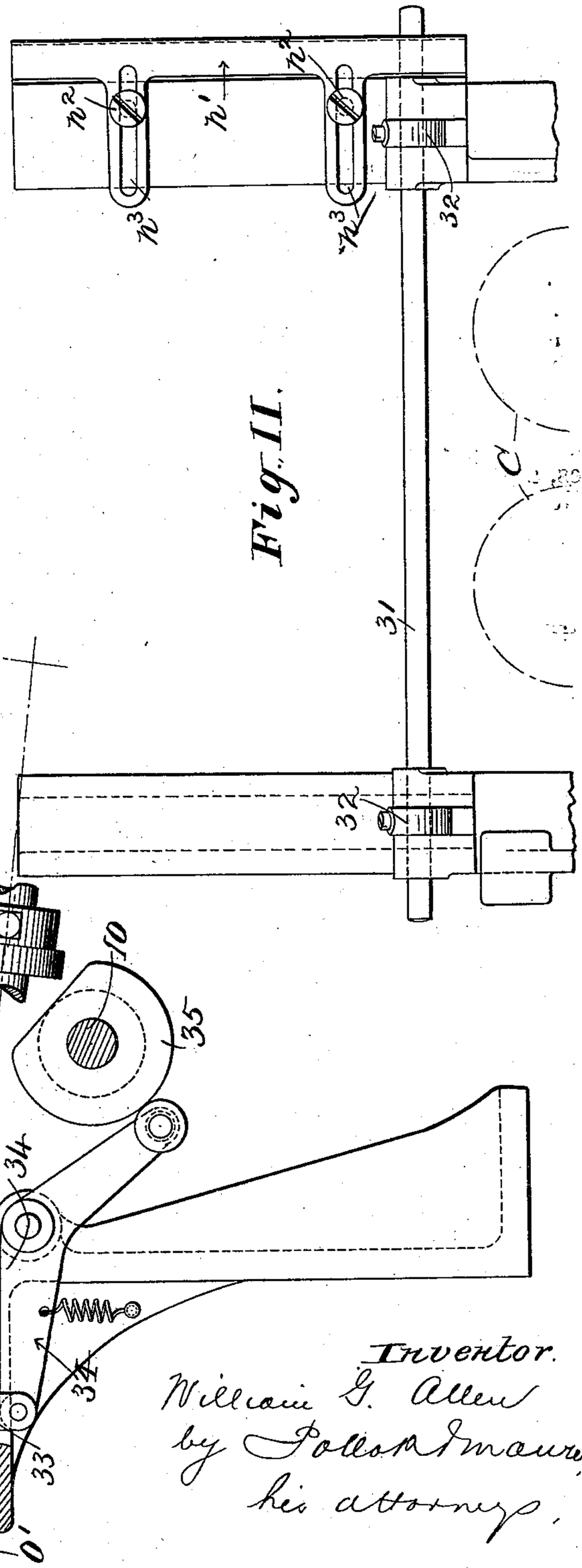

Fig. 11.

Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM G. ALLEN, OF HARTFORD, CONNECTICUT.

MACHINE FOR MAKING METAL SPOKES.

SPECIFICATION forming part of Letters Patent No. 605,050, dated May 31, 1898.

Application filed May 9, 1896. Serial No. 590,944. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. ALLEN, of Hartford, Connecticut, have invented new and useful Improvements in Machines for Making Metal Spokes, which are fully set forth in the following specification.

This invention relates to the manufacture of wire spokes such as used in wheels of bicycles and has particular reference to the heading and bending of the spoke.

Heretofore the heading and bending operations have usually been performed by two distinct machines; and the object of this invention is to accomplish these operations expeditiously in a single machine.

In the better class of bicycles the spokes are swaged for the greater part of their length, this step being performed before the heading and bending; but in cheaper grade machines the wire spokes are not swaged, but are of the same diameter throughout. By the machine hereinafter described spokes of this character can be made directly from a coil of wire, being straightened, cut to proper length, headed, and bent. Means, however, are also provided whereby swaged spokes can be fed to the machine for heading and bending.

In the preferred form of machine in which the invention is carried out feed mechanism is provided whereby the spokes are fed sidewise—that is, in a direction transverse to their length—through the machine. The feed is intermittent, carrying the spoke first to the header or punch, by which the head is upset, and returning while this operation is being performed, then advancing again, carrying forward both spokes, the first toward the bending devices and the second toward the header. By successive steps the spokes are fed through and out of the machine. In the particular feed movement preferred the feed-cylinders advance by a longitudinal movement and return by a gradual spiral or screw motion, the spoke remaining stationary during this return movement.

The invention embraces the particular form of feed mechanism both in combination with other coöperating elements of the particular machine and also independently for other uses to which it may be applied. This feed mechanism consists, essentially, of one or more (preferably two) horizontal sleeves or cylinders having each a spiral groove therein, the pitch of the spiral being equal to the length of a single step of the feed movement. The sleeves have a longitudinal forward and backward or reciprocating movement. During the forward movement the spoke, lying across the cylinders and engaged by a groove of each, is advanced one step. This movement is quickly made. The sleeves have also a constant movement of rotation, and their backward or return movement is so timed with reference to the speed of rotation that the spoke resting in the spiral groove remains stationary during this return movement. In other words, the return movement is given by a cam or equivalent device having the same pitch as the spiral grooves. This mechanism renders it unnecessary to employ gripping devices of any sort for seizing, advancing, and releasing the spokes and permits of a number of spokes being in transit through the machine at the same time without duplication of the feeding devices.

The invention embraces certain features of construction and combinations and arrangements of parts, as hereinafter explained.

In the accompanying drawings, illustrating one embodiment of my invention in a practical apparatus, said drawings forming part of this specification, Figure 1 is a plan view. Fig. 2 is a side elevation thereof. Fig. 3 is a sectional view through one of the feed-cylinders and its operating mechanism. Fig. 4 is an elevation, partly in section, of the heading mechanism. Fig. 5 is a sectional view through the gripping device for such mechanism, whereby the spoke is held during the formation of the head. Figs. 6 and 7 are views corresponding to Figs. 4 and 5 of the bending devices. Fig. 8 is a detail of the cams and operating-lever for the bending device; and Figs. 9, 10, and 11 are respectively a side elevation, plan view, and front elevation, of mechanism for delivering blanks previously severed into lengths to the feed-cylinders.

At one side of the machine is an upright frame or casting B, Fig. 2, formed with a deep horizontal slot or recess *b*, extending entirely across it, this recess being for the passage of the spoke, which is fed transversely across the machine in a direction at right angles to the length of the spoke. While pass-

ing through this recess the spoke comes first to the header and then to the bender.

The feed is effected by two sleeves or cylinders C C, mounted each on a shaft *c* and connected therewith by a spline *c'* or similar connection to permit longitudinal motion of the sleeve independently of its shaft. Shafts *c* are continuously rotated in the same direction from shaft 10 through bevel-gears 11 12 and spur-gears 13 14 15, the gear 14 being an intermediate or idler.

The cylinders have each a spiral groove c^2, extending from end to end thereof, the grooves in the cylinders being in the same line, so that a straight wire or spoke *x*, Figs. 1 and 2, can be engaged by a groove in each cylinder. The axes of the feed-cylinders are slightly inclined, so that the spoke when resting in the grooves will be square with the machine.

The rotation of the cylinders has nothing to do with the feed of the spoke, which is effected intermittently by the longitudinal forward movement of the cylinders. This movement, as well as the return movement, is effected by a cam-groove c^3 in the end of the cylinder, in which engages a roller c^4 on a fixed support c^5. When in the rotation of the cylinder the abrupt incline c^6, Fig. 1, comes against the roller, the cylinder advances by a quick movement, the distance of the feed being equal to the distance between the spirals of groove c^2. The gradual incline of the cam thus causes the cylinder to return. The pitch of this part of the cam is the same as that of the spiral groove, so that during the return movement the spoke remains in the position to which it has been advanced, the thread simply unwinding itself, so to speak, under the spoke.

Omitting for the present the description of the devices for placing the blanks in position on the feed-cylinders, the construction of which devices will depend on whether the blanks have been previously separated or are formed in the machine itself from a continuous wire, I will proceed to describe the mechanism whereby the blanks are first headed and then bent to the required angle, it being assumed that each time the cylinders return a blank is laid in the first of the feed grooves or channels and advanced step by step, as above explained, its forward end traversing the slot *b* during such movement.

The heading mechanism, to which the blank is first presented, comprises, essentially, a gripping device for the end of the wire and a suitably-operated heading or upsetting die. The gripping device comprises a stationary jaw or block *d*, adjustable by means of a bolt d' and a movable jaw d^3, carried by a slide d^4 and operated from a shaft 16 by a toggle-joint d^5. Jaws *d* and d^3 come together in the line of slot *b*. Shaft 16 is reciprocated from an eccentric 19 on shaft 17 through an arm 20 and pitman 21. *e* is the heading or upsetting die carried by a plunger e', mounted in a suitable way on a plate E, secured to casting B and vertically adjustable thereon by means of bolt e^7 to bring the die to the proper alinement. Plunger e' has thereon a projection or lug e^2, through which passes a pin e^3, to the ends of which connect springs e^4, operating to retract the plunger after each stroke, such movement being limited by a stop-bolt e^5. In the rear end of the plunger is screwed a head e^6, which may be adjusted to vary the length of the stroke. This head receives the impact of a hammer *f*, which operates to drive the plunger, said hammer receiving its motion from eccentric 18 on shaft 17. At the instant the feed-cylinders present a blank between the jaws *d* and d^3 the slide d^4 is actuated to move jaw d^3, thereby tightly gripping and holding the wire-blank, which projects at its end slightly beyond the jaws. The plunger e' now makes its working strokes, and a head of proper shape is formed upon the blank, which is then released by the gripping-jaws and carried forward by the next sliding movement of the feed-cylinders. The bending mechanism, which the headed blank next encounters, is most clearly shown in Figs. 6, 7, and 8, and, like the heading mechanism, it includes as an essential part a gripping device consisting of a stationary jaw *g* and a movable jaw g', meeting in the line of slot *b*, the movable jaw being operated from shaft 16 in a manner similar to jaw d^3 of the heading mechanism. Arranged adjacent to the jaw *g* is a vertically-operating slide *h*, carrying at its lower end a die-block h', which bears against the edge of jaw *g*. Jaw g' is recessed at one side, as at g^2, and die-block h' recessed, as at h^2, providing proper space, which the head of the blank or spoke occupies as the die-block descends and imparts the proper bend to the spoke. Slide *h* is actuated by a lever h^3, having at its end a yoke h^4, embracing shaft 17, and carrying rollers h^5 h^6, bearing against cams 22 and 23, respectively, on said shaft. It will be understood that when the headed blank has been advanced to a position between the jaws *g* g', the headed end projecting beyond said jaws, the movable jaw is actuated to grip the spoke, and the die h' descends to bend the end, as clearly shown in Fig. 6. A reverse movement of the parts ensues, and the spoke is fed forward another step by the longitudinal movement of the cylinders.

As shown in Figs. 1 and 2, I have illustrated mechanism for forming the blanks in the machine itself from a continuous wire *y*, which passes into the machine through a straightening device 1, between feed-pulleys *k*, and then through a bushing *l*, where it is operated upon by a cutter *m* and severed into blanks *x* of suitable length, which are laid in the grooves of cylinders C C. The feed-pulleys *k* are operated from the shaft of one of the cylinders C through bevel-gears 24 25, shaft 26, gears 27 28, and gears 29 30. Cutter *m* is operated by a cam-wheel 39 on shaft 26.

Referring now to Figs. 9, 10, and 11, which

show another form of mechanism for delivering the spoke-blanks to the feed-cylinders, *n n* are two vertical ways in which the ends of spoke-blanks severed to the proper length engage. In order to provide for spokes of different lengths, plate *n'*, forming one of the ways, is adjustable by means of set-screws n^2 in slots n^3. Projecting into the bottom of each way is a vibratory supporting-slide *o*, having a sharpened end *o'* and operated by a lug o^2 on shaft 31, said shaft being oscillated by means of arm 32, link 33, lever 34, and cam 35 on shaft 10.

The devices above referred to being so disposed that the spokes resting one above another in the ways *n n* lie directly above the spiral grooves of cylinders C C the quick vibratory movements effected by cam 35 cause points *o'* of slides *o* (which are simultaneously operated) to drop the blanks one by one onto the cylinders.

It will be understood that the several operations and movements of parts herein described are so timed and regulated as to take place in proper order, the whole machine working automatically.

Departures from the precise construction shown and described may be made within wide limits without departing from the principle of the invention.

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

1. In a machine for making wire spokes, the combination of devices for forming a head on one end of the spoke, devices for bending the headed end to form a shoulder, and feed mechanism for feeding the blanks to said devices in succession, substantially as described.

2. In a machine for making wire spokes, the combination of devices for forming a head on one end of the spoke, devices for bending the headed end to form a shoulder, and feed mechanism for feeding the blanks to said devices in succession, the action of the heading devices and bending devices taking place simultaneously upon different blanks, substantially as described.

3. The combination of the heading devices, the bending devices, feed mechanism for presenting the blanks successively to the heading devices and bending devices, and automatically-operated gripping devices for holding the blanks during the heading and bending operations, and for releasing the same upon the completion thereof, substantially as described.

4. The combination with heading and bending devices arranged to act successively upon each spoke, and simultaneously upon different spokes, of means for feeding the blanks to said devices in a direction transverse to the length of the blanks, by an intermittent movement, substantially as described.

5. The combination with heading and bending devices arranged to act successively upon the spoke-blanks, of rotary feed-cylinders having spiral grooves thereon in which the blanks are laid, means for moving the cylinders forward longitudinally, whereby the spoke-blanks are advanced by an intermittent movement, and means for gradually returning the cylinders by a movement commensurate with the pitch of said spiral grooves, substantially as described.

6. The combination with devices for acting successively upon a wire-blank, of feeding mechanism for the blanks comprising horizontal rollers movable lengthwise of their supporting-shafts and having spiral peripheral grooves, means for rotating said rollers, and means for imparting to them an intermittent forward motion and for returning them at a speed corresponding with the pitch of the spiral grooves, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM G. ALLEN.

Witnesses:
G. J. CAPEWELL,
HARRY R. BOARDMAN.