(No Model.) 7 Sheets—Sheet 1.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

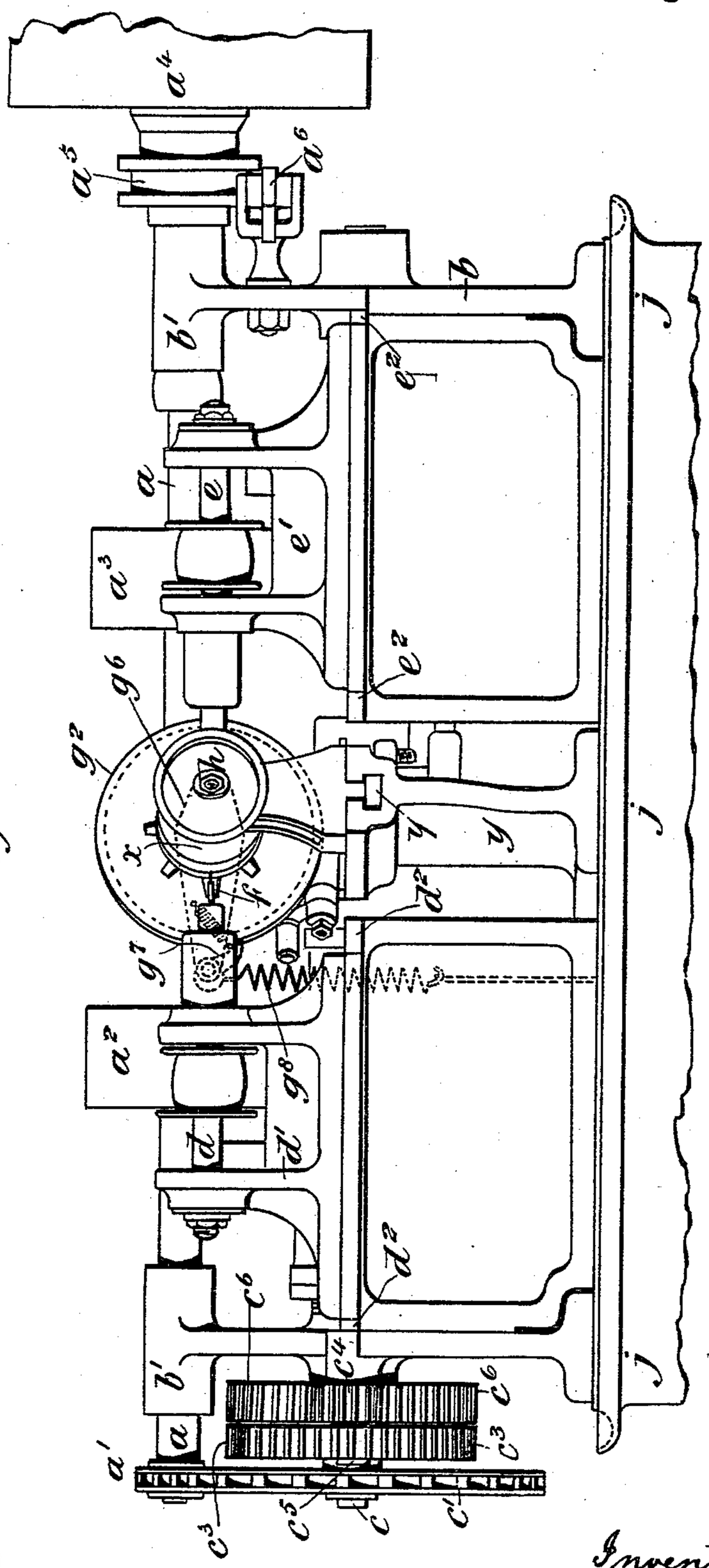


Fig. 1.

Attest.
S. H. Knight.
E. L. Knights.

Inventor
William Hillman
By Knight Bros.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

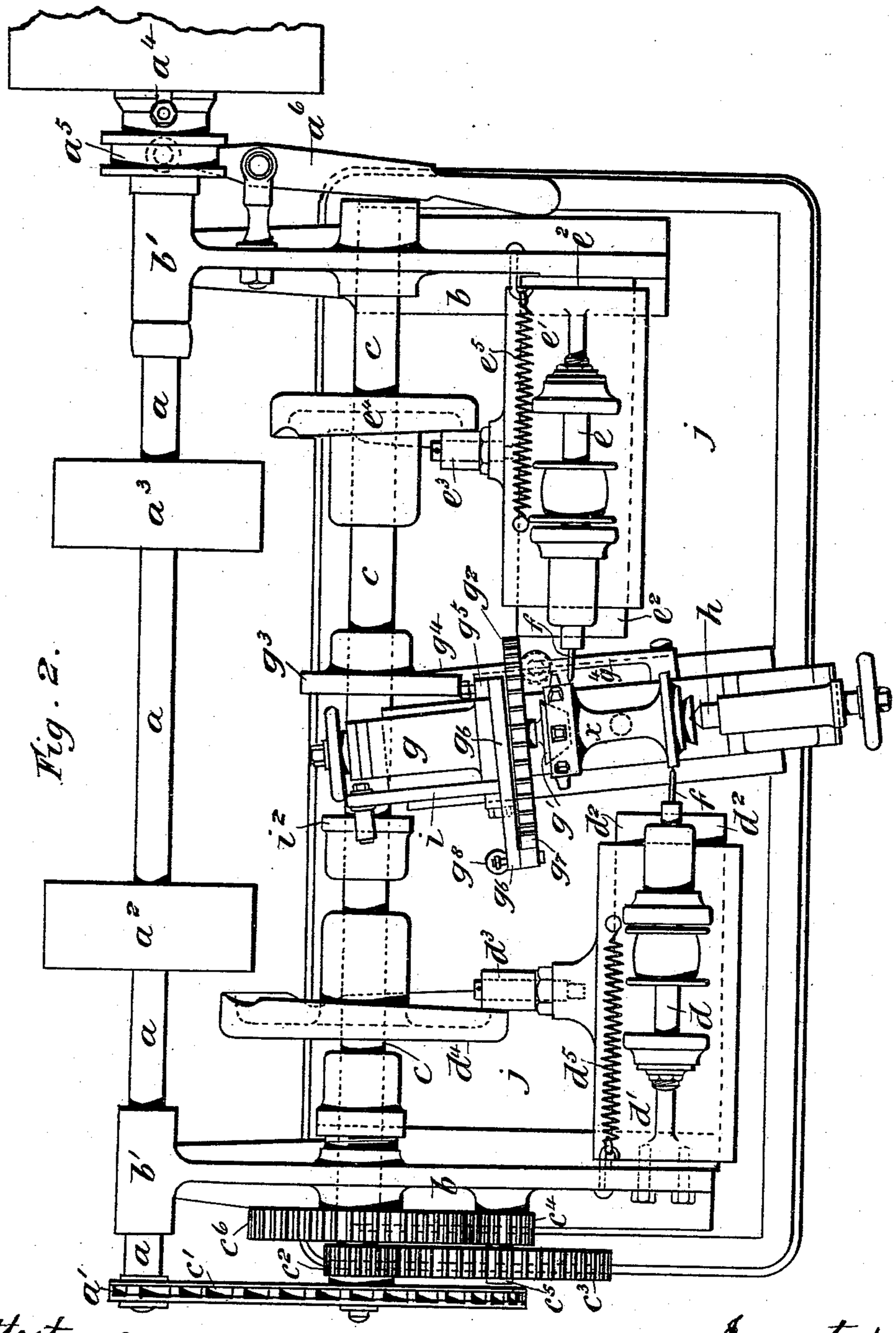
7 Sheets—Sheet 2.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

Fig. 2.



Attest:
S. A. Knight
E. L. Knight

Inventor
William Hillman
By Knight Bros
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

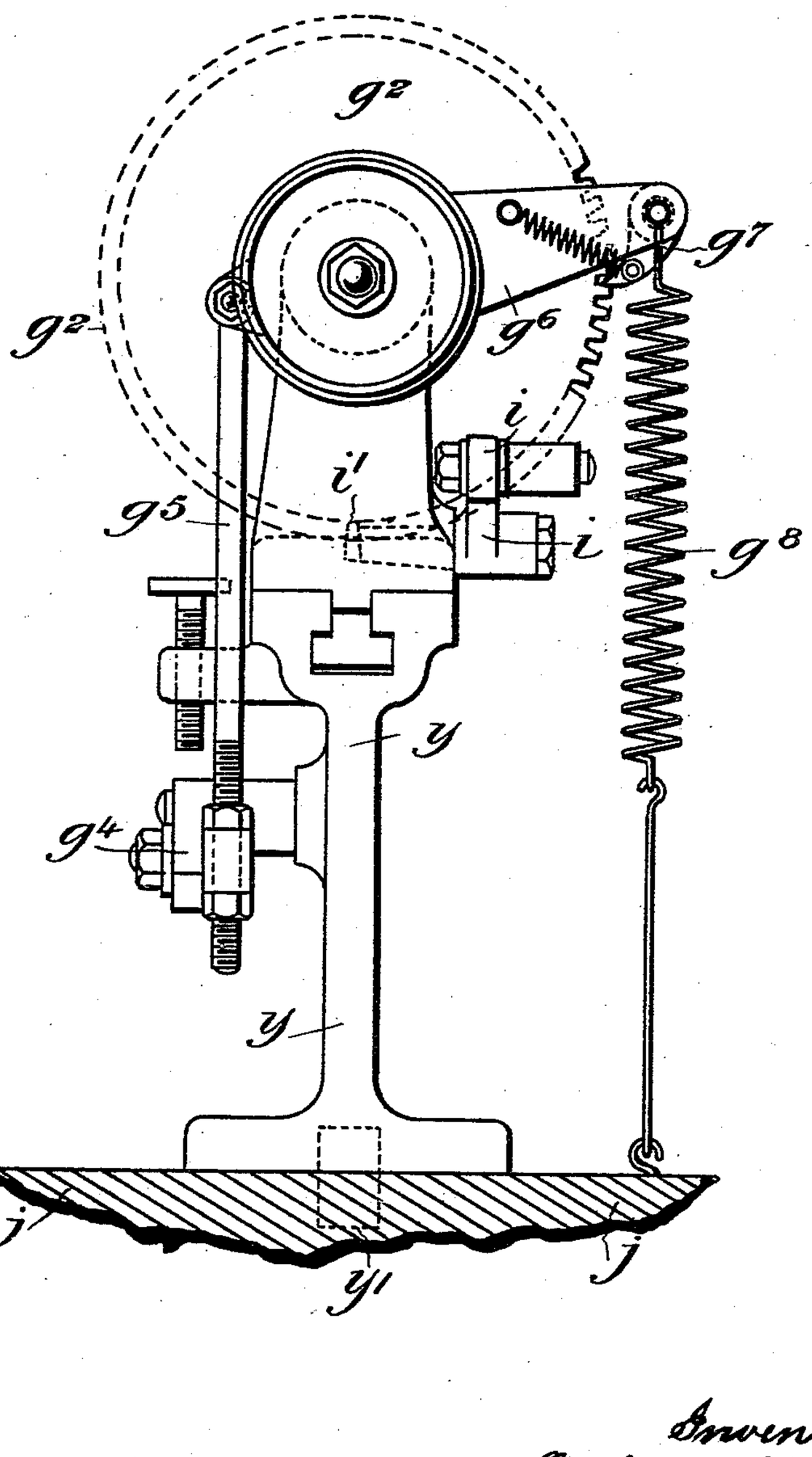
(No Model.) 7 Sheets—Sheet 3.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

Fig. 3.



Attest:
S. H. Knight.
E. L. Knight.

Inventor
William Hillman
By Knight Bros.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

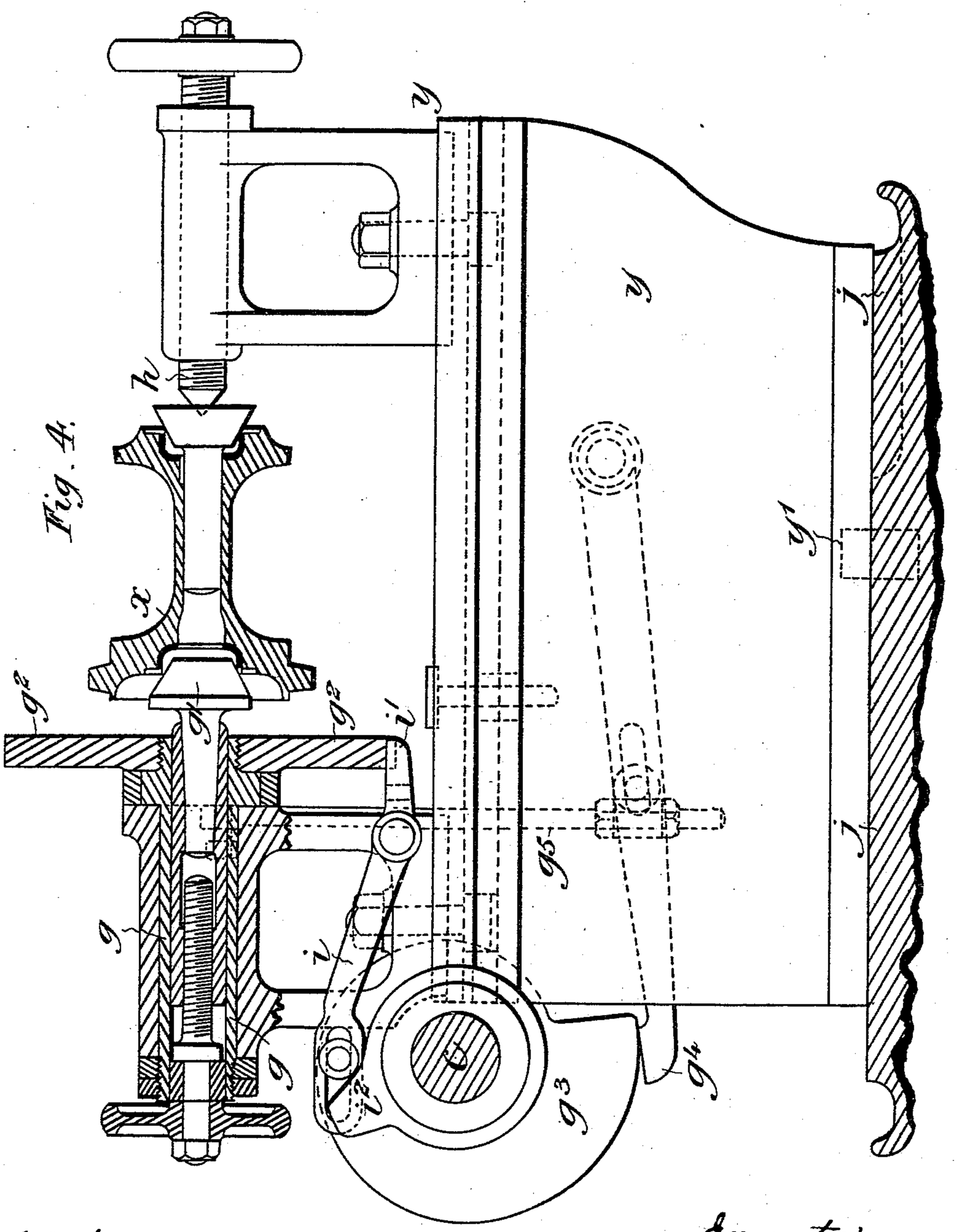
(No Model.) 7 Sheets—Sheet 4.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

Fig. 4.



Attest
S. H. Knight
Ed. Knight.

Inventor
William Hillman
By Knight Bros.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

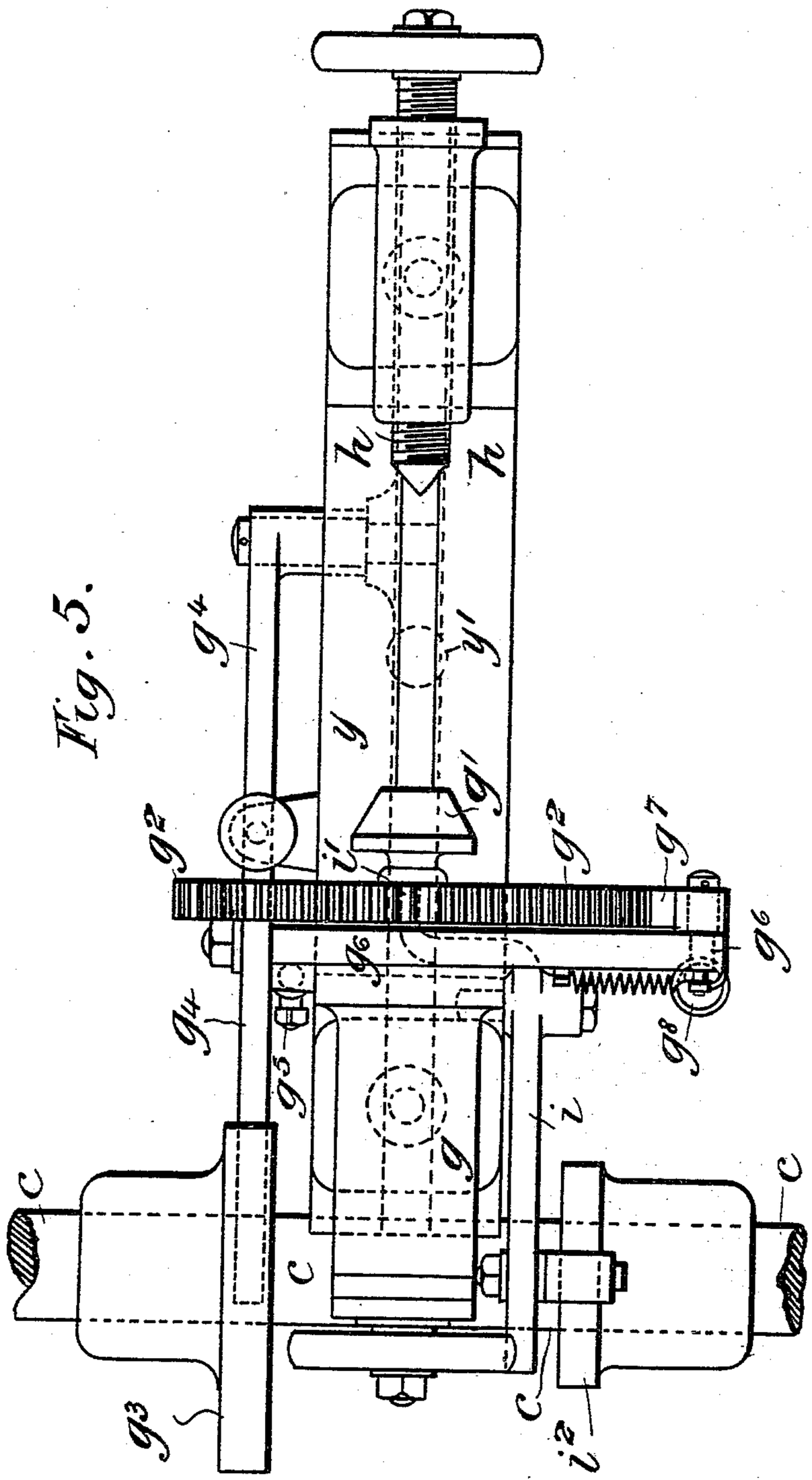
(No Model.) 7 Sheets—Sheet 5.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

Fig. 5.



Attest
S. H. Knight.
E. L. Knight.

Inventor:
William Hillman
By Knight Bros.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 7 Sheets—Sheet 6.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

Fig. 7

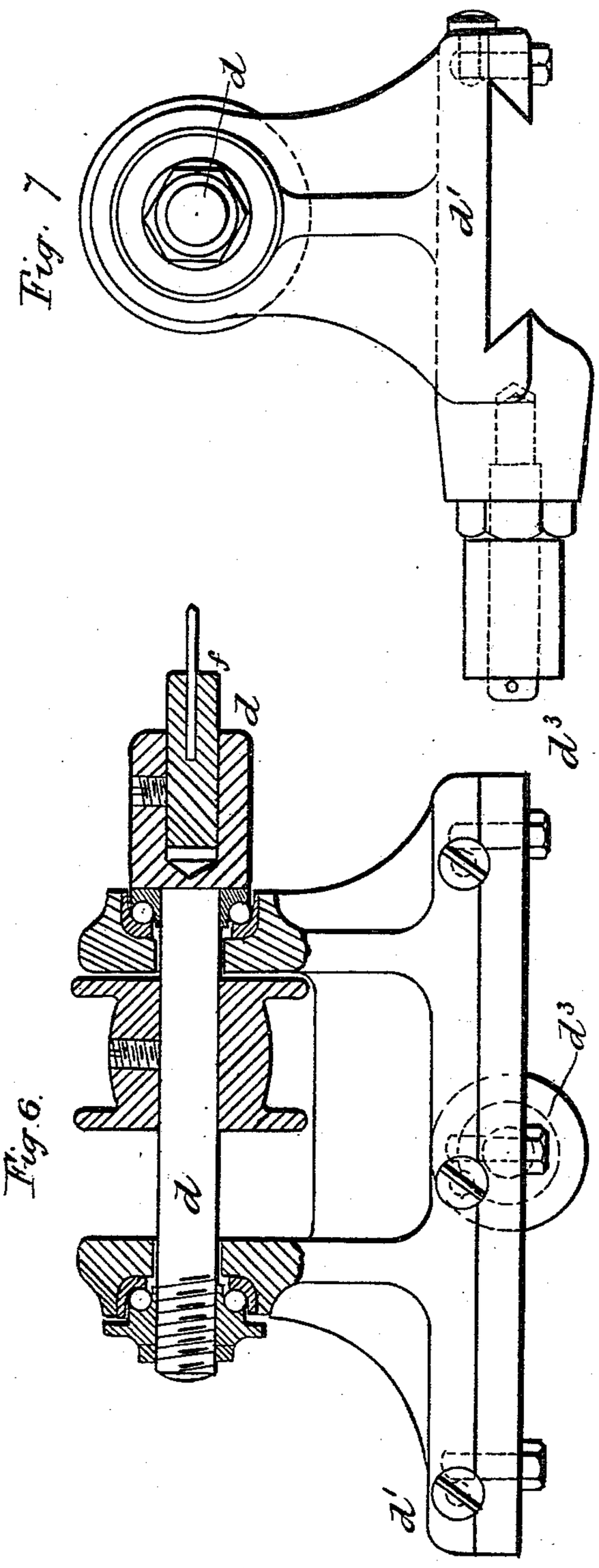


Fig. 6.

Attest
S. H. Knight
E. L. Knight.

Inventor
William Hillman
By Knight Bros.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 7 Sheets—Sheet 7.

W. HILLMAN.

MACHINE FOR BORING SPOKE HOLES IN HUBS.

No. 457,719. Patented Aug. 11, 1891.

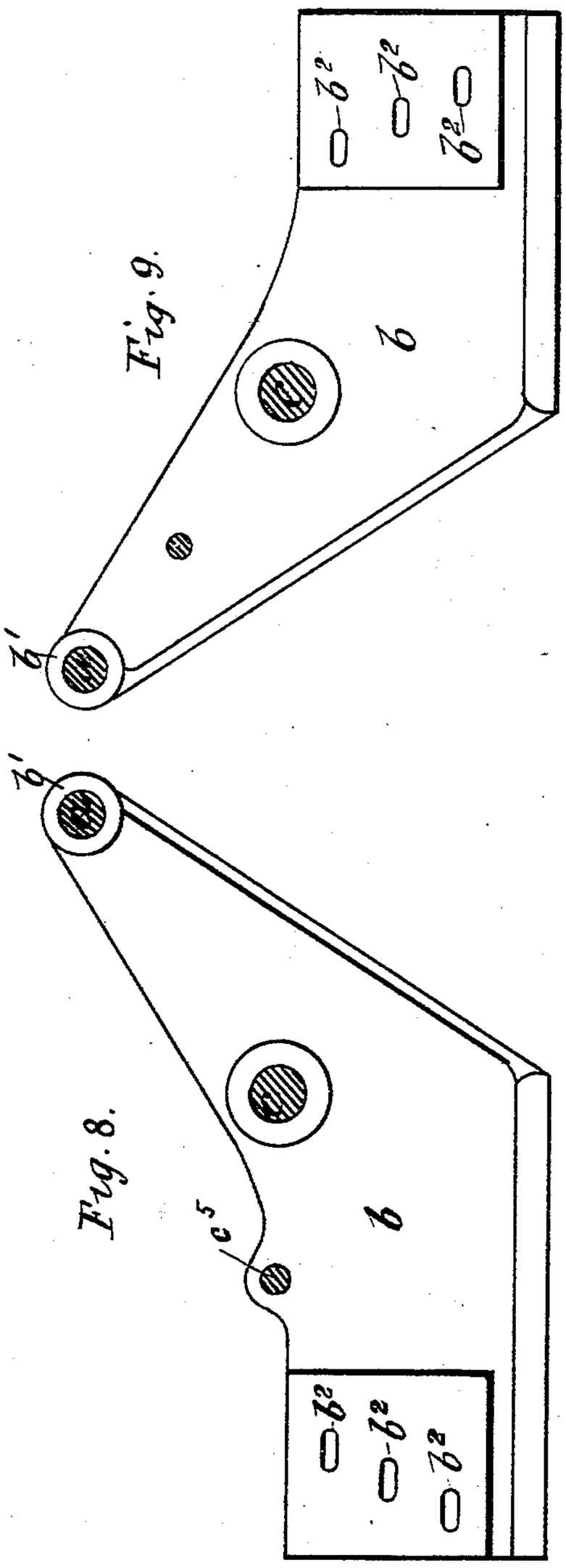


Fig. 8.

Fig. 9.

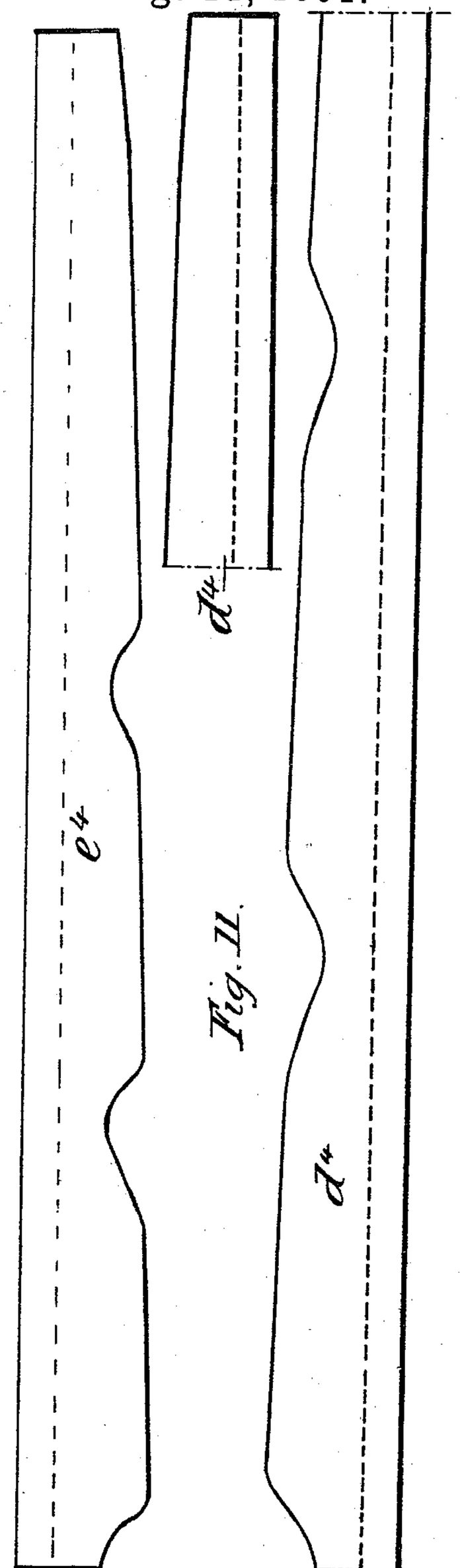


Fig. 10.

Fig. 11.

Attest
S. H. Knight
E. L. Knight.

Inventor
William Hillman
By Knight Bros.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM HILLMAN, OF COVENTRY, ENGLAND.

MACHINE FOR BORING SPOKE-HOLES IN HUBS.

SPECIFICATION forming part of Letters Patent No. 457,719, dated August 11, 1891.

Application filed September 5, 1890. Serial No. 363,994. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HILLMAN, a subject of the Queen of Great Britain, residing at Coventry, in the county of Warwick, England, have invented certain new and useful Improvements in Machinery for Drilling or Boring the Spoke-Holes in the Hubs of Velocipede and such like Wheels, of which the following is a specification.

The invention has for its object improvements in machinery for drilling or boring the spoke-holes in the hubs of velocipede and such like wheels.

In the accompanying drawings, Figure 1 is a front elevation, and Fig. 2 is a plan, of a hub-drilling machine constructed according to my invention. Fig. 3 is a back elevation of the dividing apparatus. Fig. 4 is a side view of same, partly in section, showing the carrier for holding the hub; and Fig. 5 is a plan thereof. Fig. 6 is a sectional elevation of one of the head-stock spindles carrying the drilling or boring tools. Fig. 7 is a back view of same. Figs. 8 and 9 are side views of brackets forming parts of frame-work, showing slots for permitting adjustment of the head-stock-spindle beds. Fig. 10 is a development of the cam e^4, and Fig. 11 is a development of the cam d^4 of the hub-driller.

In all the figures like parts are indicated by similar letters of reference.

The machine is provided with a back driving-shaft a, which is mounted in bearings b', formed in or carried by brackets b of the framing. On one end of this shaft a is fixed a chain-wheel a', which by means of a chain gives motion to another chain-wheel c', mounted loosely on the cam-shaft c, and which by the following arrangement of gearing gives motion to said cam-shaft. The chain-wheel c' is fixed to a toothed pinion c^2, which gives motion to a toothed wheel c^3 and its connected toothed pinion c^4, mounted loosely on the fixed stud or pin c^5, and said toothed pinion c^4 gives motion to the toothed wheel c^6, fixed on the cam-shaft c. The back driving-shaft a by means of two pulleys a^2 a^3 fixed thereon, aided by straps or bands, one of which is crossed, also gives motion to two head-stock spindles d e, carrying the drilling or boring tools f.

The hub x, Fig. 2, is mounted between two adjustable spindles g h, one g of which is provided with a suitable conical or other carrier g' to hold the hub x securely, while the other h is a back center and is capable of being run in and out for the insertion and removal of the hub.

The carrier-spindle g has fixed therein a driving and holding disk g^2, which is formed with a number of openings or recesses in its periphery similar to a dividing-plate to enable the same to be rotated at the required times through a certain portion of a revolution, and then to be held firmly while the drilling or boring is effected. This step-by-step motion to the carrier-spindle g is given by means of a cam g^3 on the cam-shaft c operating a lever g^4, which by a link g^5 operates a driving-lever g^6, provided with a pawl g^7, acting in combination with the recesses in the dividing plate or disk g^2, a spring g^8 acting upon such latter lever in the contrary direction. For convenience the parts are arranged so that the cam g^3 shall carry the driving-lever g^6 backward and the spring g^8 shall give it the forward or feed motion; but, if desired, the reverse arrangement can be adopted. After the carrier-spindle g has been rotated, as above described, a tooth i' on one end of a holding-lever i, operated by a cam i^2 on the cam-shaft c and by a spring, is caused to enter one of the openings or recesses in the dividing disk or plate g^2, and thereby securely hold it and consequently the hub x while the boring or drilling is being effected. The action of the cam i^2 and spring is such that the holding-lever i is removed from the dividing disk or plate g^2 immediately before the latter is moved by the feed-lever, while directly after such feed action the holding-lever i is again caused to engage with the notched edge of the dividing plate or disk g^2. The carrier-spindle g and back center h are mounted in head-stocks fixed to a bed y, which is capable of adjustment on a center y' and of being fixed at any required angle on the bed j.

The boring-spindles d e are mounted in sliding head-stocks d' e', which are capable of movement to and fro on short beds d^2 e^2, fixed on the main bed j of the machine, but with capability of adjustment thereon in a transverse direction, so as to enable the said boring-spindles d e to be adjusted to hubs

having flanges of different distances apart. One of these spindles *d e* is arranged, as will be seen on examining the drawings, to act on one side of one of the flanges and the other on the opposite side of the other flange. These sliding head-stocks *d' e'* are each fitted with a truck or roller d^3 or e^3, which is acted upon by a cam d^4 or e^4, fixed on the cam-shaft *c*, to give the necessary forward and backward motions to the drills *f*, as required for drilling or boring the holes and for permitting the rotating of the hub *x* between the boring or drilling motions, as also intermediate to and fro motions to free the holes from the borings.

As clearly shown in Figs. 2, 10, and 11, the cams d^4 e^4 are irregular—that is, they are provided with abrupt inclines—thus constituting long and short cams, the purpose of the long cams or the regular portions being to impart the general movement to the drill, while the short cams or abrupt portions are for the purpose of giving the short reciprocal movement for closing the holes of the borings. Springs d^5 e^5 are employed to keep the said trucks or rollers d^3 e^3 up to their cams.

I prefer to arrange the boring or drilling head-stocks *d' e'* parallel to the driving-shaft *a*, and to mount the carrier and driving-spindle *g* and back center *h* at such an inclination as to cause the drills or boring-tools *f* to enter the flanges of the hubs at the required angle; but, if desired, the reverse arrangement may be adopted—that is to say, the drilling head-stocks may be mounted at inclinations with the driving-shaft and the carrier and driving-spindle *g* and back center *h* may be mounted at right angles with such shaft.

As above described, and as represented in the drawings, the drills *f* act on opposite sides of the hub-flanges and in the same horizontal plane. The hub will therefore require to have such a number of holes drilled therein as when divided by two will yield an odd number, in order to insure the two opposite holes being drilled in a plane passing through the center of the hub. If desired, however, the drills *f* can be arranged at a slight vertical angle to each other, in which case a hub requiring any given number of holes can be drilled. The driving-pulley a^4 is loose on the shaft *a*, and it is fitted with friction-segments operated by a sliding clutch a^5 and lever a^6 to fix it to or release it from the shaft *a* in a similar manner to that now well understood.

The transversely-adjustable reciprocating drill-spindles carrying the anti-friction rollers d^3 and the springs and cams for moving the said spindles to and from the carrier, and also the dividing-plate for rotating the carrier, the latch for locking the pawl for rotating said dividing-plate, and the cams for operating said pawl and latch, (shown but not claimed in this application,) are shown and claimed in my application, Serial No. 363,993, of even date with this, for improvements in machines for boring holes in fellies.

What I claim, and desire to secure by Letters Patent, is—

1. In machinery for drilling or boring the spoke-holes in the hubs of velocipede and such like wheels, the combination of drills acting on opposite sides of the hub, sliding head-stocks carrying such drills, cams and springs for giving to-and-fro motion to such head-stocks, hub-carrier adjustable on an axis *y'* and fitted with dividing-plate, driving mechanism for giving motion to the dividing-plate, lever for holding and releasing the dividing-plate, and cams, levers, and springs for operating the driving mechanism and the holding and releasing lever, substantially as herein shown and described.

2. In machinery for drilling or boring the spoke-holes in the hubs of velocipede and such like wheels, the combination of drills acting on opposite sides of the hub, sliding head-stocks carrying such drills, and irregular cams and springs acting to give to the drills a generally forward motion when drilling, combined with intermediate to-and-fro motions to free the holes from the borings, substantially as herein shown and described.

3. In machinery for drilling or boring the spoke-holes in the hubs of velocipede and such like wheels, the combination of drills acting on opposite sides of the hub, sliding head-stocks carrying such drills, cams and springs for giving motion to the sliding head-stocks, short beds having transverse adjustment, and hub-carrier head-stock mounted on a center of motion and capable of adjustment to the required angle between such drills, substantially as herein shown and described.

4. In a drilling-machine, the combination, with the hub-carrier, of a drill-spindle mounted to slide to and from said carrier, and long and short cams for reciprocating said spindle, whereby an intermediate movement will be imparted to the drill during its general movement, substantially as set forth.

5. In a drilling-machine, the combination, with a drill, of the hub-carrier head-stock mounted to move transversely of the drill, and the revoluble hub-carrier mounted in said head-stock, substantially as set forth.

6. In a drill-machine, the combination, with the drill, of the hub-carrier having the spindles *g' h*, the adjustable head-stock, in which said carrier is mounted, and the dividing-plate and locking device, substantially as set forth.

WILLIAM HILLMAN.

Witnesses:
FREDERICK BAXTER,
G. PERSALL LOCKER.