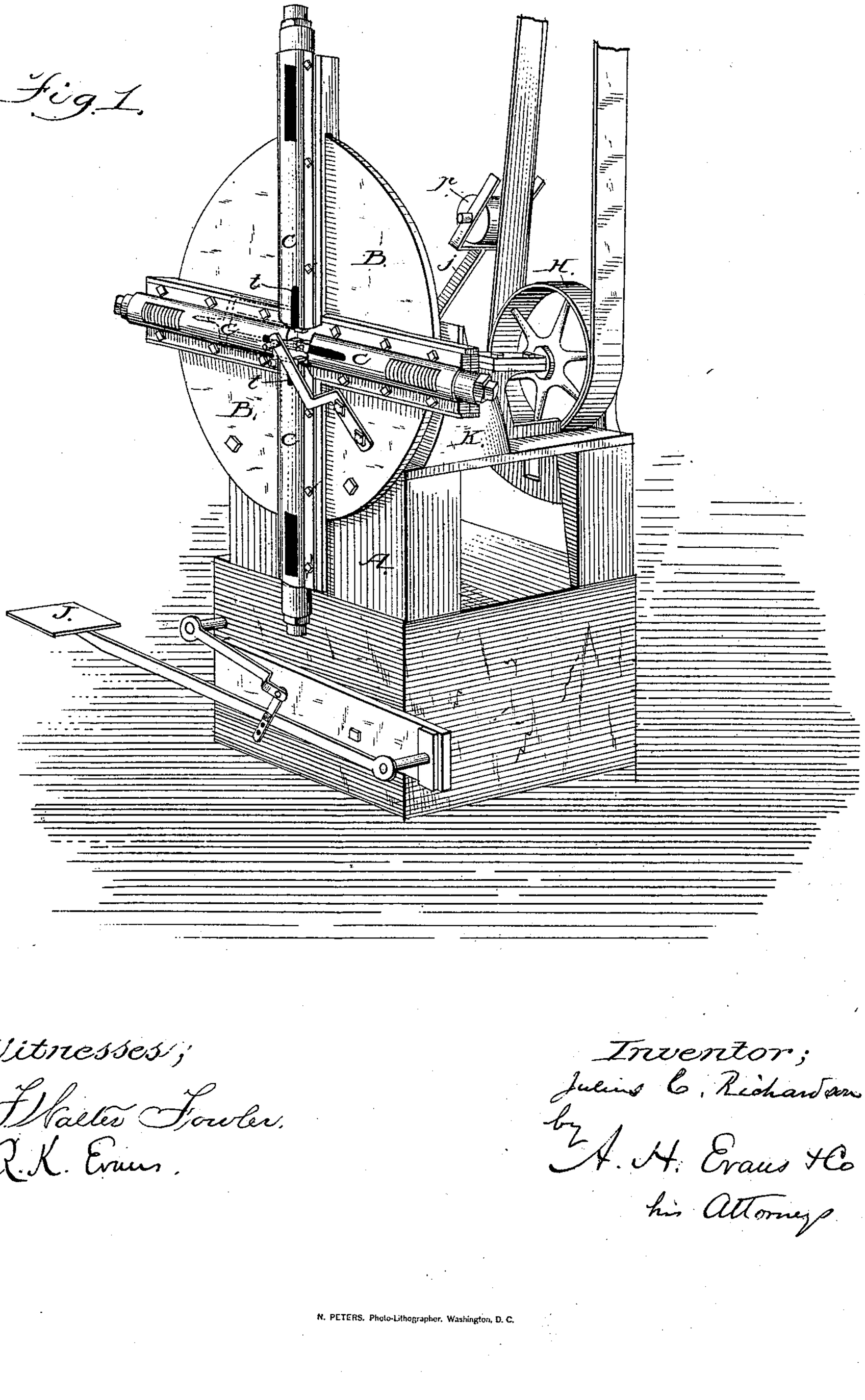
(No Model.) 5 Sheets—Sheet 1.

J. C. RICHARDSON.

FORGING MACHINE.

No. 250,757. Patented Dec. 13, 1881.

Fig. 1.



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(No Model.)

5 Sheets—Sheet 2.

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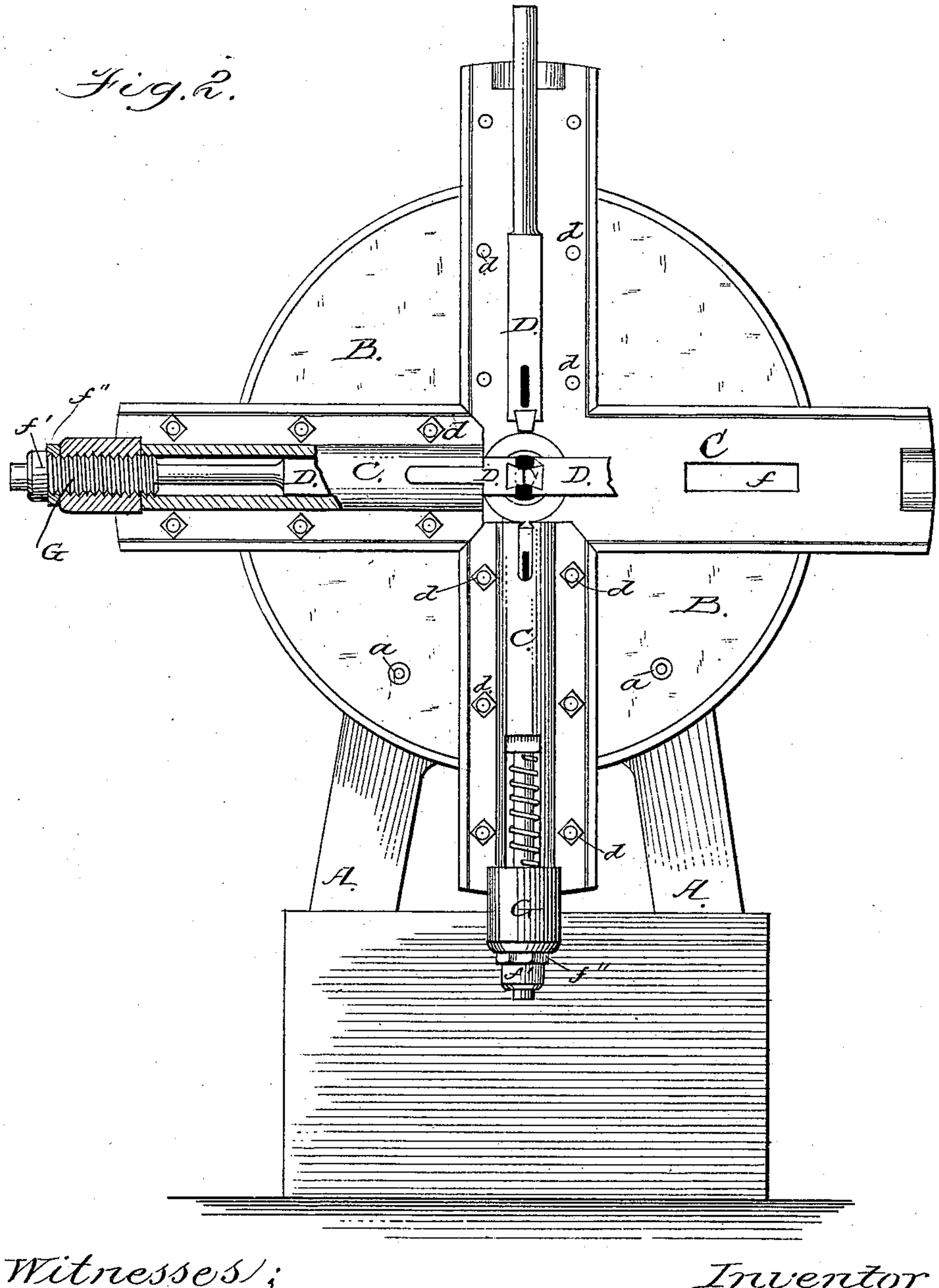
Fig. 2.



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(No Model.)

5 Sheets—Sheet 3.

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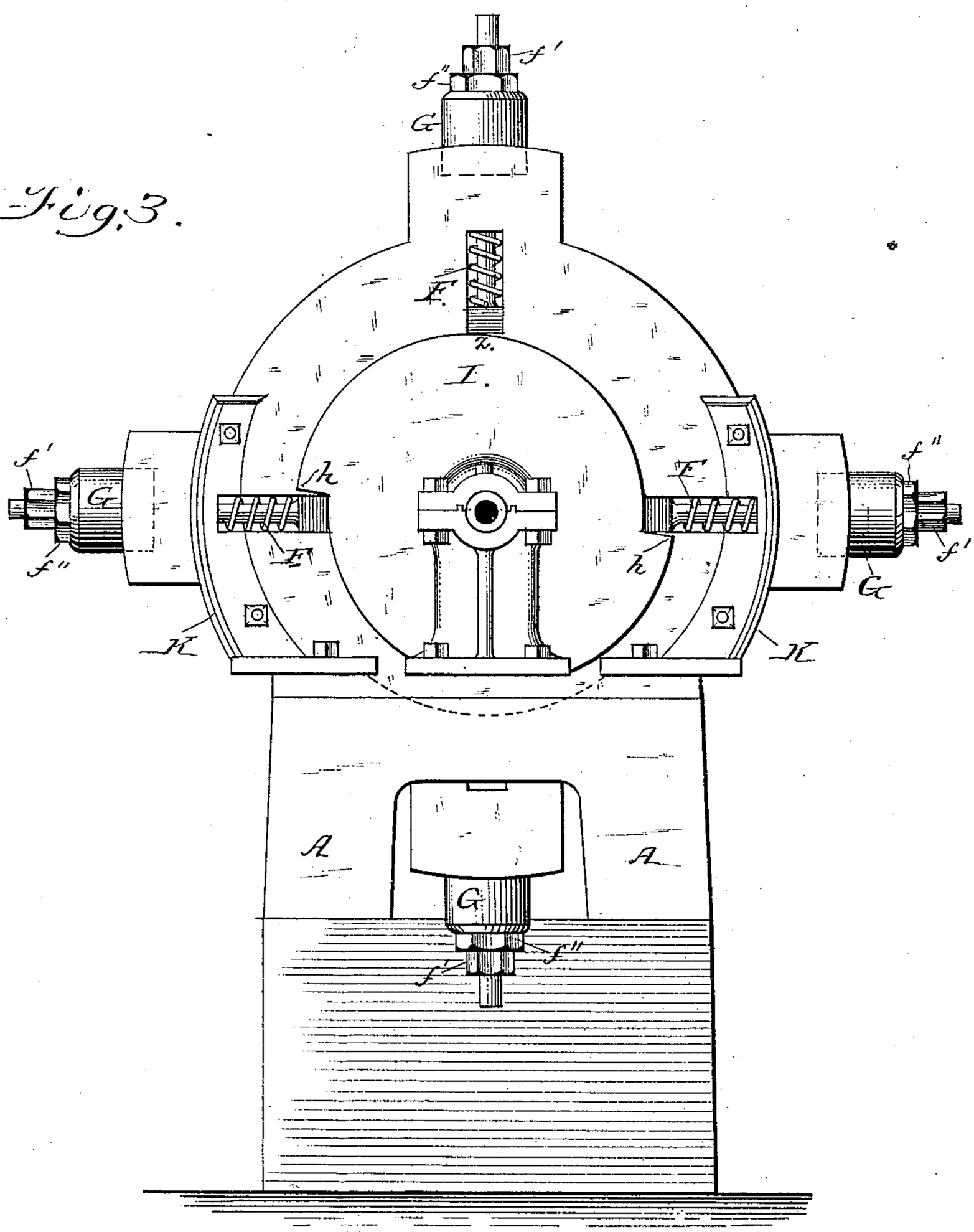
Fig. 3.



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(No Model.)

5 Sheets—Sheet 4.

J. C. RICHARDSON.

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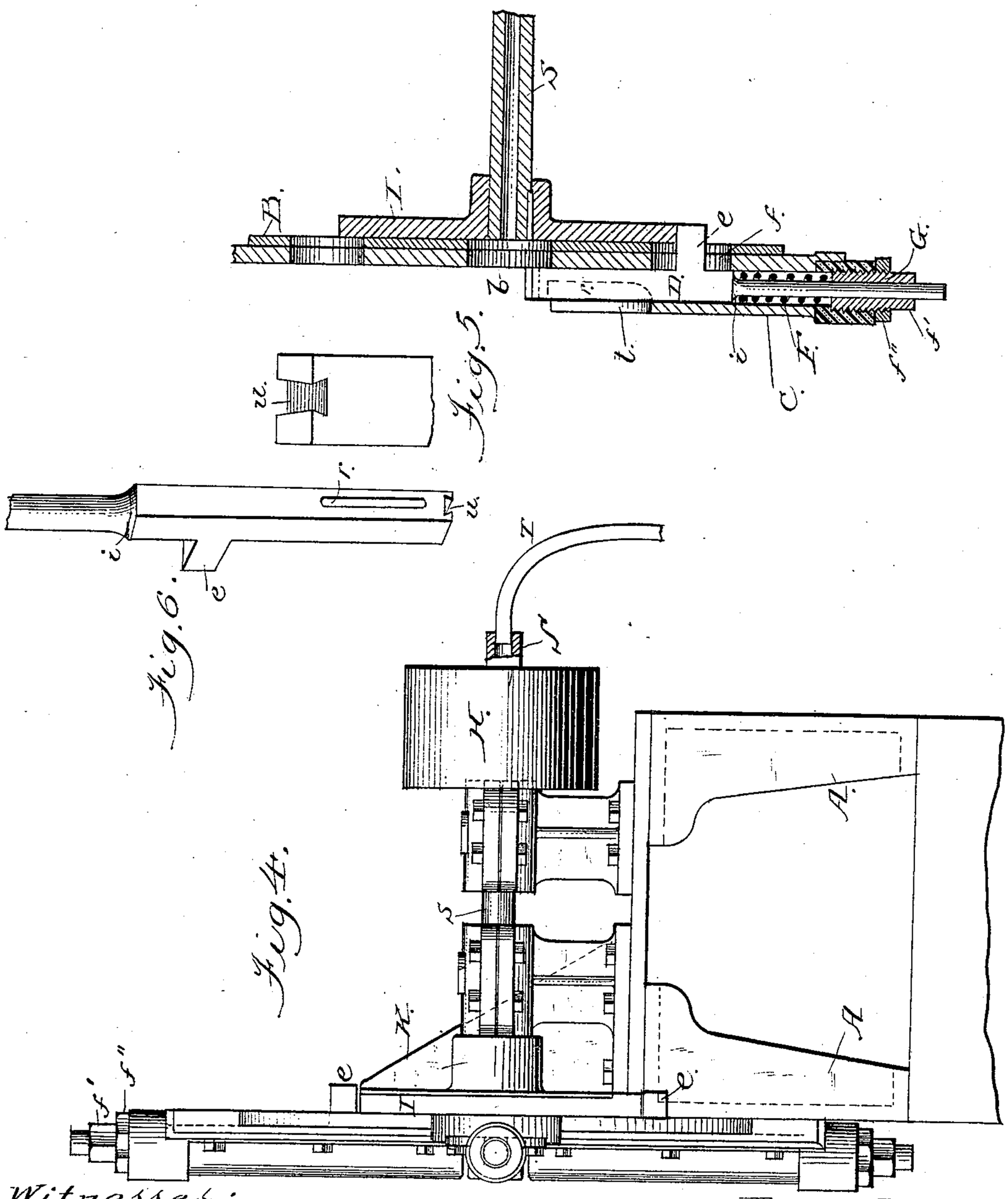

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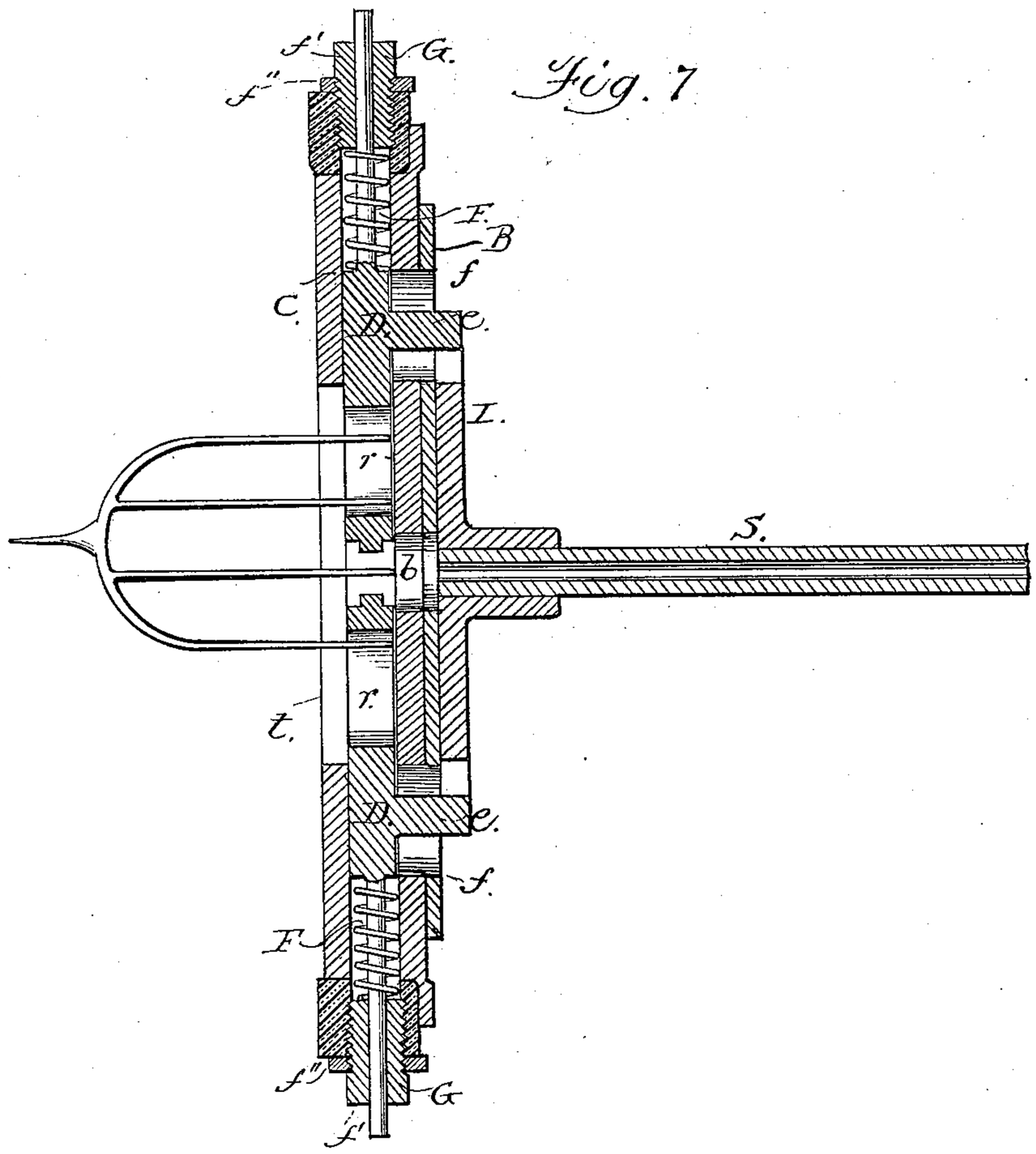
(No Model.) 5 Sheets—Sheet 5.

J. C. RICHARDSON.

FORGING MACHINE.

No. 250,757. Patented Dec. 13, 1881.

Fig. 7



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UNITED STATES PATENT OFFICE.

JULIUS C. RICHARDSON, OF COLUMBUS, OHIO.

FORGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 250,757, dated December 13, 1881.

Application filed August 27, 1881. (No model.)

To all whom it may concern:

Be it known that I, JULIUS C. RICHARDSON, of the city of Columbus, and State of Ohio, have invented certain Improvements in Forging-Machines; and I hereby declare the same to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of the machine. Fig. 2 is a front elevation of the same. Fig. 3 is a rear elevation. Fig. 4 is a side elevation. Fig. 5 is a horizontal section. Fig. 6 is a view of one of the hammers. Fig. 7 is a sectional view of the forging devices with a fork-blank in position.

The object of my invention is to provide a machine which will quickly and economically forge metal work; and my invention consists of a series of radially-arranged plunging-hammers, sliding within removable radial boxes secured to a fixed disk, provided with slots through which project lugs on the hammers, combined with springs arranged in said boxes to throw the hammers, and held by screw compression-caps at the ends of the boxes, and a rotating cam-plate moving in a plane parallel to and in the rear of the fixed disk, and timed to operate the hammers in alternating pairs by means of contact with the said lugs on the hammers, whereby the springs are compressed and released, as hereinafter fully described and specifically claimed.

My invention further consists in a forging-machine having an operating-cam provided with a hollow driving-shaft which has a free and unobstructed opening throughout, in combination with hammers provided with tapering dovetail grooves for the reception of dies, whereby the dies may be driven out by means of a rod inserted from the rear of the machine.

My invention further consists in slotting the forging-hammers to provide for the reception of one or more prongs of forks or other devices while other prongs are being forged by the hammer.

In order that those skilled in the art may make and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A is a base or pedestal, to the face of which is secured by bolts *a a* a circular metal disk, B, provided with a central opening, *b*.

To the face of disk B are bolted a series of radial guideways or boxes, C C, by means of bolts *d*, and in which move plunging-hammers D D, shown, for purposes of illustration, with square bodies and round guiding-shanks. These hammers are provided with lugs *e*, which project through slots *f* to the rear of the disk B, for a purpose hereinafter described. Each one of the radial boxes has inserted at its outer end a threaded compression or tension box, G, through which pass the round shanks of the hammers, around which, within the boxes, are arranged spiral springs F F, one end of each spring resting against the inner face of each compression-box, and the other end against the butt *i* of the hammer.

By means of the heads *f'* the compression-boxes can be forced into or withdrawn from the boxes C to increase the tension of the springs on the hammers, and when in position jam-nuts *f''* secure them.

In the rear of disk B, journaled on standards *g g*, is a hollow driving-shaft, S, having both ends open and arranged concentrically with the disk, carrying a driving-pulley, H, on one end and a cam-plate, I, at the other end, the said cam-plate lying in the same plane with disk B and in such close proximity to it that its edge is beneath the lugs *e e* of the hammers, which project through disk B. The cam-plate is cut with the two highest elevating-points, *h h*, opposite each other, so that the two hammers opposite each other are operated simultaneously, and, as gravity would place the vertical hammer in a position to impede the progress of the horizontal hammers, the curvature of the cam-faces is made (see Z, Fig. 3) so that the vertical hammer is partially raised, though without materially compressing the spring, before the cams allow the throw of the horizontal hammers.

In the rear of the lower part of disk B the pedestal is cut away in a curved recess, (shown in dotted lines, Fig. 3,) to accommodate the moving cam-plate, and two curved brackets, K K, bolted to the edges of the pedestal, and the disk B serve to brace and strengthen the machine.

The applied power to this machine I have placed under the most sensitive control by the following means: The belt is so adjusted that it normally slips on pulley H. An idle-pulley, *p*, journaled in a swinging arm, *j*, controlled by a treadle, J, in front of the machine, at the feet

of the workman, is at will forced against the belt so as to tighten it, and instantly the cam-plate is revolved and continues to revolve as long as the operator presses on treadle J. When the foot is removed from the treadle and the belt relieved of the pressure of the idle-pulley the rebound of the springs acts on the cam-plate after the manner of a brake, and the machine is instantly stopped.

In actual practice I have demonstrated that a machine weighing about half a ton, made as hereinbefore described, is so sensitive that a pressure of two pounds on the treadle J will start it instantly at full speed, (fifteen hundred blows per minute,) and upon the two pounds pressure being removed from the treadle the machine stops so quickly that rarely more than one blow is struck after the pressure is relieved. This sensitiveness to starting and stopping, coupled with the rapid delivery of the blows and without manipulation, enables an unskilled workman to accomplish with one machine a vast amount of work. For instance, a workman of the highest skill is able to point five hundred four-pronged hay-forks with the usual means (trip-hammers and dies) in a working-day of ten hours, whereas an unskilled workman has pointed two thousand four-pronged hay-forks in a working-day of ten hours in my said half-ton machine. In drawing out rake-teeth from the stub-blank I have demonstrated by actual tests that I make a gain of seventy-one per cent. in production, using unskilled workmen.

I have found that I can greatly facilitate the forging of fork-tines and similar articles by slotting the vertically-moving hammers for a distance greater than their travel, as seen at *r*, Figs. 6 and 7, and correspondingly slotting the boxes C, as seen at *t*, so that when one tine or tooth is being operated upon the others enter the slots *r*, and do not interfere with the movements of the hammers, as shown in Fig. 7. The faces of the hammers are provided with grooves *u*, which are dovetailed in a vertical line and tapered or wedge-shaped in a horizontal line to receive the dies P, the tenons of which are of corresponding shape. The dies are driven into the hammer-faces from the front of the machine, and when they are to be removed the air-blast pipe T is sprung out of the rear end of hollow shaft S, a rod is introduced, and by blows upon it the dies are driven out of the grooves. The air-pipe T conveys a blast from any convenient blower into the hollow shaft S, whence it passes out through the opening *b*, blowing all the scale from the hammers and work, and in such a direction that none of it can get into the working-joints of the machine. The joint between the hollow shaft and the air-pipe T is made by simply springing the curved end of the pipe into the rear open end of the shaft, where it fits snugly, but is not fixed to the shaft, so that the shaft revolves freely around the end of the pipe.

In forging thrasher-teeth in this machine I find the best dies adapted to it to be those described in Patent No. 207,069, issued to me August 13, 1878. The construction of this machine is such that it will perform the most extreme, rapid, and intense service without breaking down.

I am aware that heretofore forging-machines have been made and used wherein radially-arranged plunging spring-hammers have been operated by means of a double cam revolved in a shell and actuated by means of a hollow shaft, through which passes a device for arresting the hammers; but in none of these known devices is the radial hammer carried in a removable box bolted to the face of the fixed disk; nor is it contemplated that the dies in the hammer-faces are to be removed from the rear of the machine; nor am I aware that any such machine has ever been constructed with removable radial boxes secured to the face of a fixed disk and said boxes provided with compression screw-caps telescoping within the radial boxes; nor am I aware that there has been before used in such forging-machines hammers having faces provided with tapering dovetail grooves for the reception of the dies, in combination with a hollow driving-shaft, though I am aware that *per se* tapering dovetail grooves for holding dies and a hollow driving-shaft are not novel. Hence I make no broad claim to any of these agencies admitted to be old, but confine myself strictly to my construction and combination of devices.

I am also aware that it is not new to conduct a blast-pipe to or near the forging-point in a forging-machine for the purpose of blowing away the scales or cooling the dies, and hence I make no claim to such device; but,

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

1. In a forging-machine provided with radial plunging hammers operated by a cam, the hammers D and fixed disk B, in combination with the removable boxes C, attached to the face of disk B, and provided with compression screw-caps G, bearing against springs F, all constructed, arranged, and operated as set forth.

2. In a forging-machine having radial plunging hammers operated by a double cam, the hammers D, provided with tapering dovetail grooves *u*, for receiving the dies, in combination with a hollow shaft supporting and actuating the cam, whereby the dies may be driven out of the hammers from the rear of the machine, as set forth.

3. In a forging-machine operated by a rotating cam, the hollow shaft S, actuating said cam, in combination with a loose telescoping blast-pipe T, all constructed and operated as described.

4. In a forging-machine, the hammers D, provided with longitudinal slots *r*, of greater length than the length of travel of the hammers, for the purpose specified.

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