(No Model.) 4 Sheets—Sheet 1.

B. HUBER.

STOP CYLINDER PRINTING MACHINE.

No. 300,370. Patented June 17, 1884.

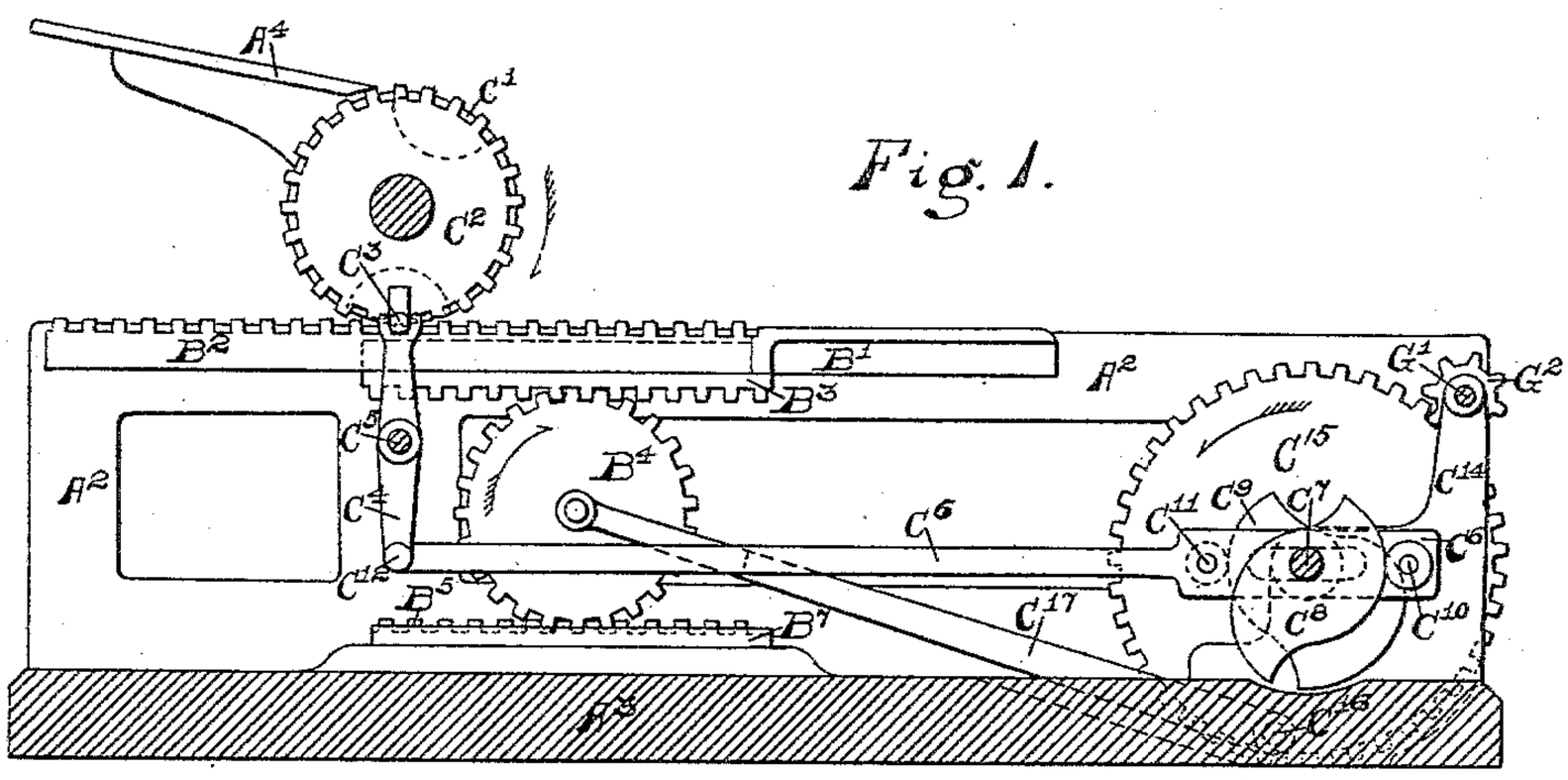

Fig. 1.

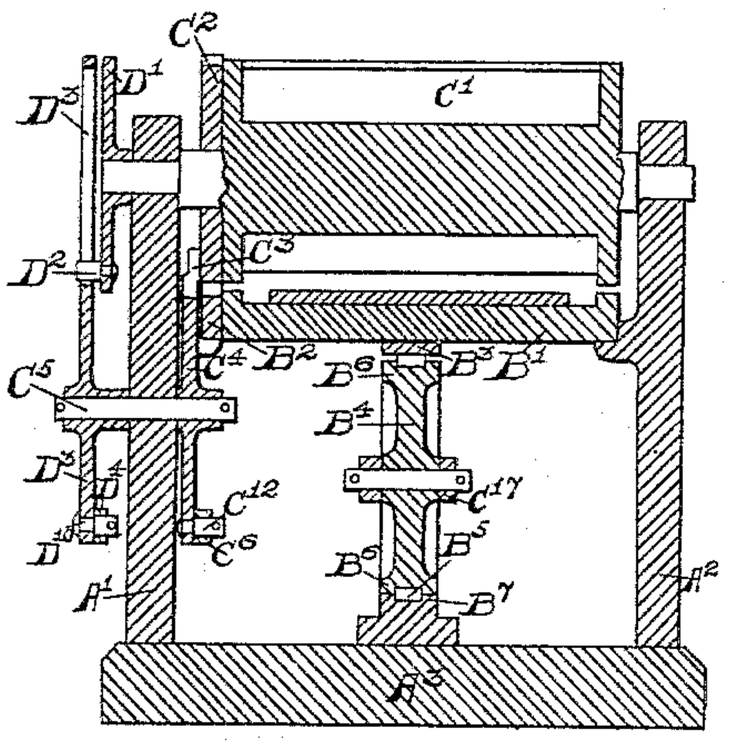

Fig. 3.

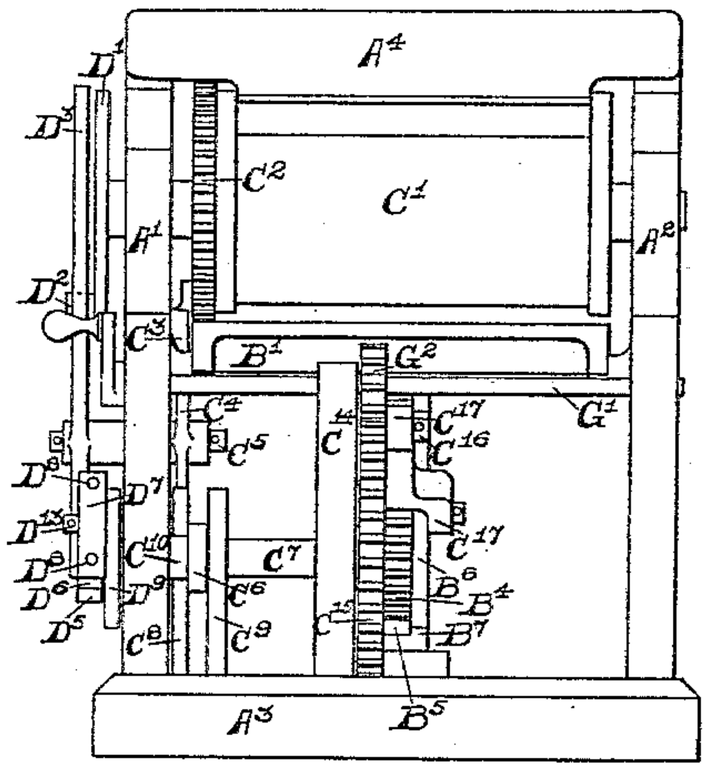

Fig. 4.

WITNESSES:

Ellen M Lucas

Wm. F. Magruder.

INVENTOR

Berthold Huber

ATTORNEY

(No Model.) 4 Sheets—Sheet 2.

B. HUBER.

STOP CYLINDER PRINTING MACHINE.

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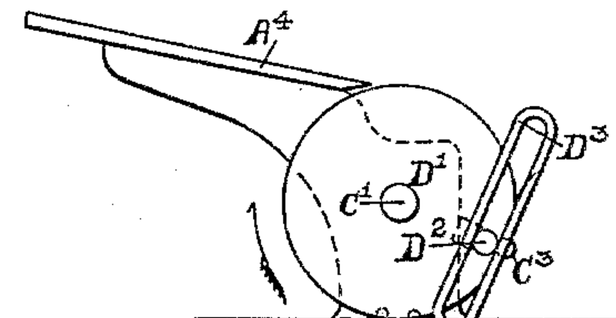
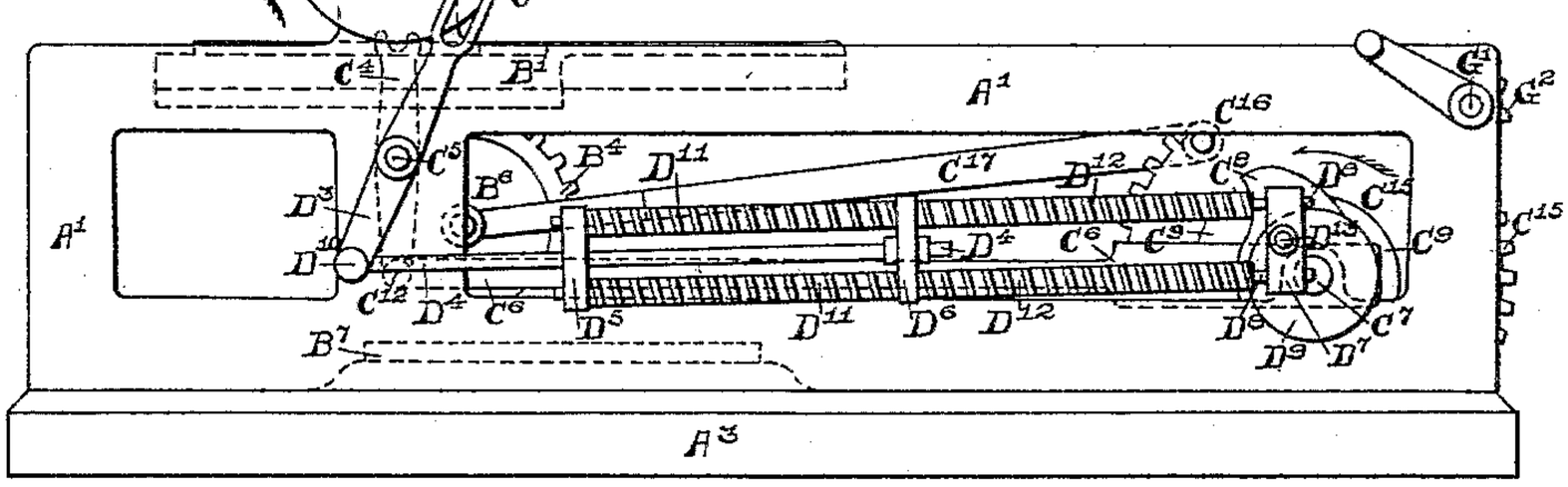


Fig. 2.



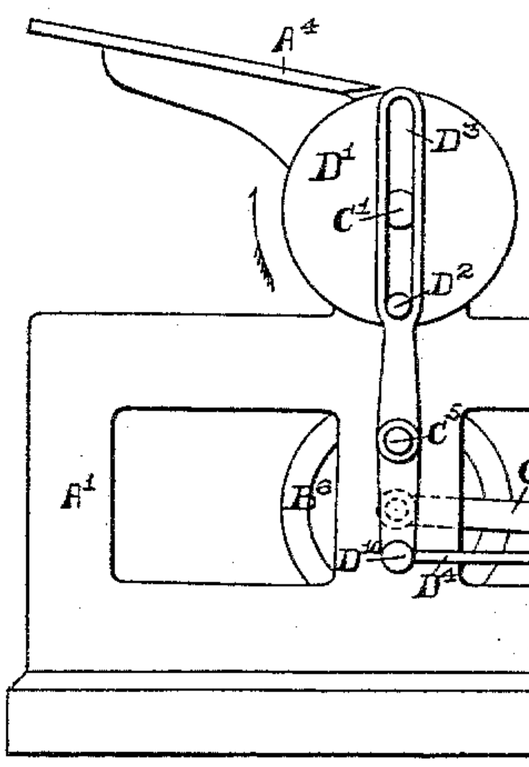


Fig. 5.

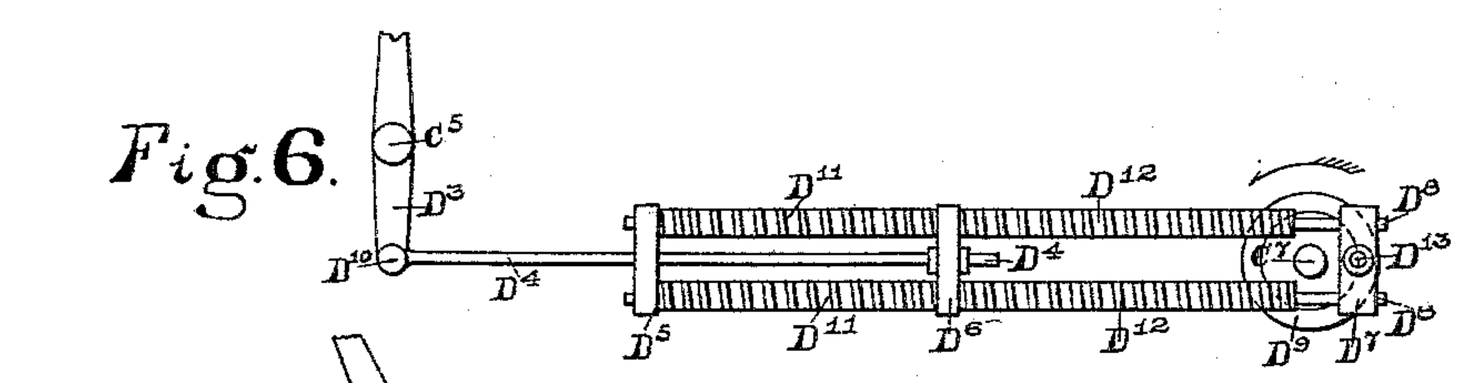


Fig. 6.

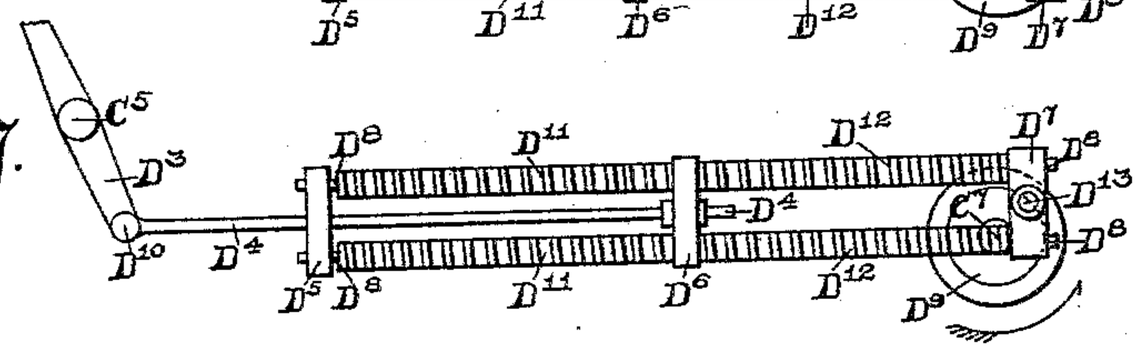


Fig. 7.

WITNESSES:
Ellen M Loueces
Wm F. Magruder.

INVENTOR
Berthold Huber

(No Model.) 4 Sheets—Sheet 3.

B. HUBER.

STOP CYLINDER PRINTING MACHINE.

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Fig. 8.

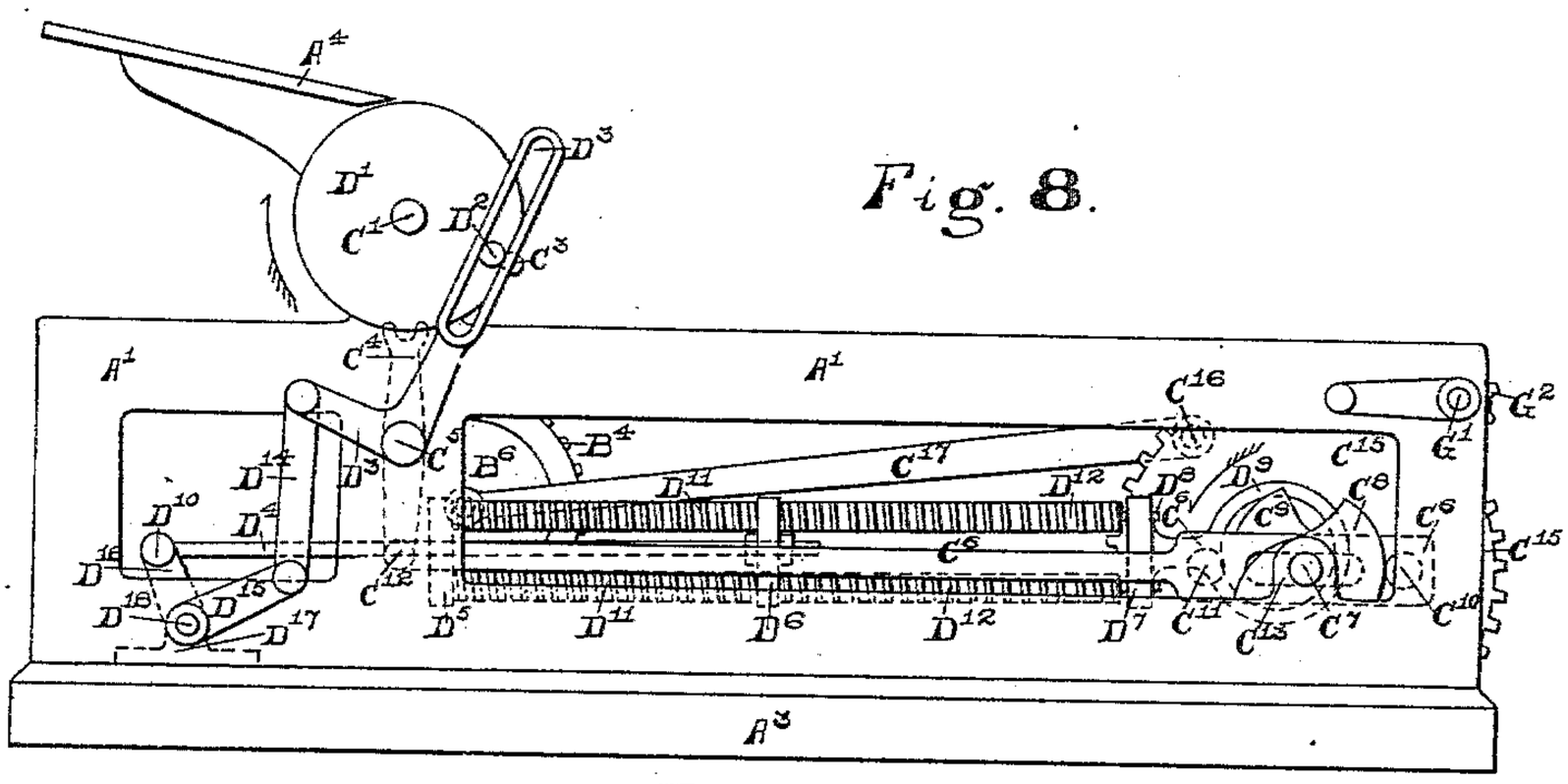
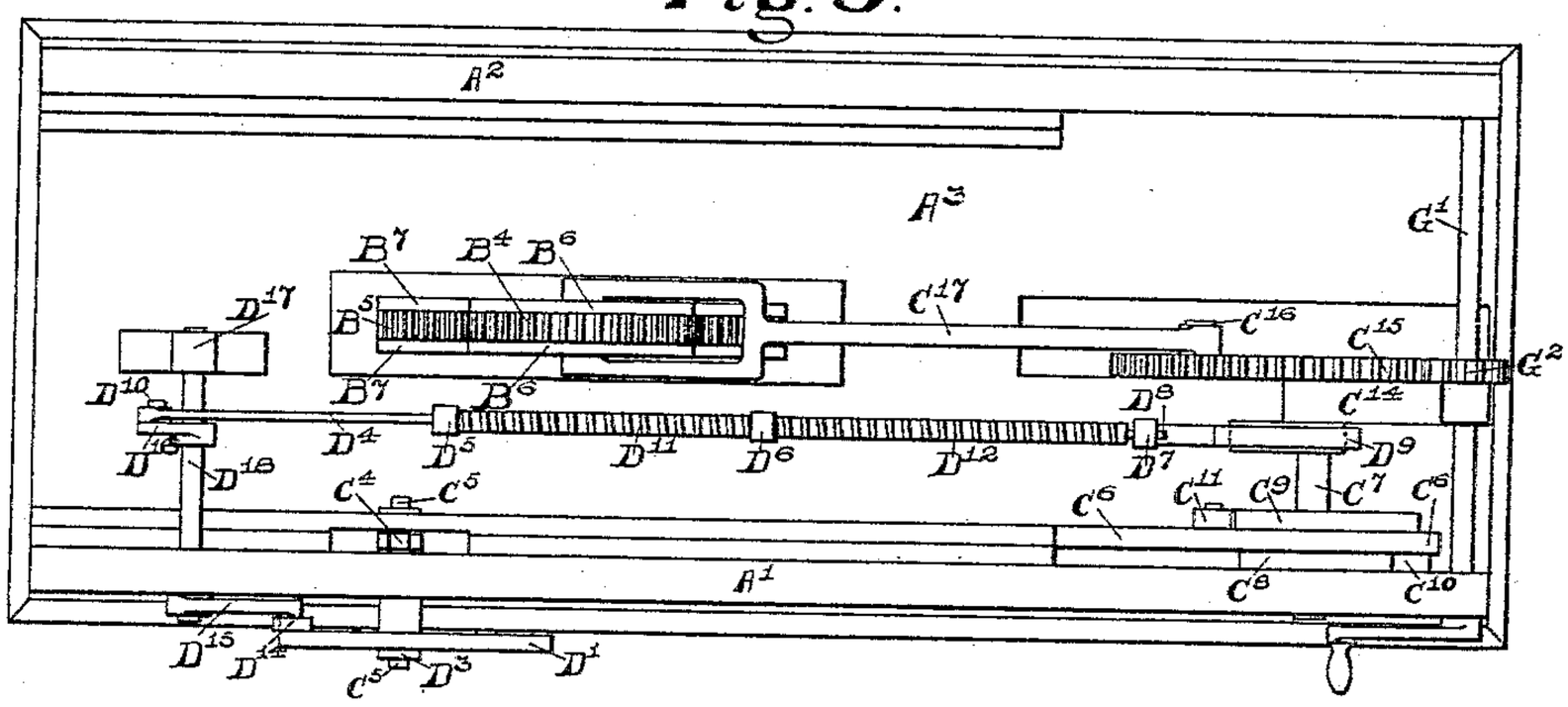


Fig. 9.



WITNESSES:
Ellen M. Lucas
Wm. F. Magruder.

INVENTOR
Berthold Huber

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B. HUBER.

STOP CYLINDER PRINTING MACHINE.

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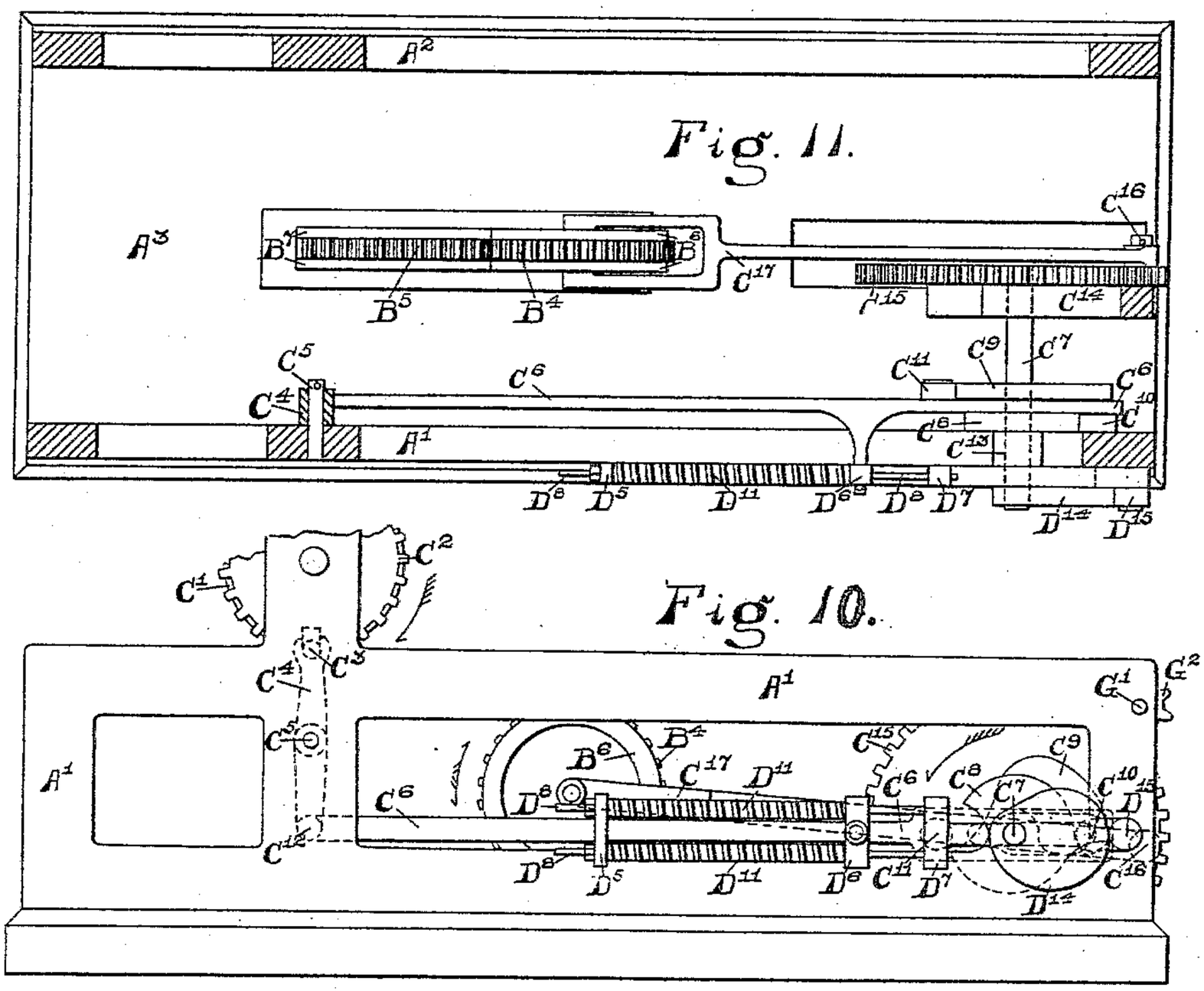

Fig. 11.

Fig. 10.

WITNESSES:
Ellen M. Lucas
Wm. E. Magruder.

INVENTOR
Berthold Huber

UNITED STATES PATENT OFFICE.

BERTHOLD HUBER, OF TAUNTON, MASSACHUSETTS.

STOP-CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 300,370, dated June 17, 1884.

Application filed July 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, BERTHOLD HUBER, a citizen of the United States, residing at Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Stop-Cylinder Printing-Machines, of which the following is a specification.

My invention relates to an improvement in the mechanism used for stopping and starting again the cylinder in a stop-cylinder printing-press. In this class of printing-presses the cylinder obtains its motion during the largest part of each revolution from the bed alone, while the bed may be driven by the ordinary crank-motion or by any other suitable mechanism. While on the impression or forward stroke of the bed the cylinder is geared directly to the bed; but on the return-stroke of the bed the cylinder stands still, continuing its intermittent motion constantly in one direction on the next forward stroke of the bed. In order to let the rack on the bed, which gears directly with the gear on the cylinder, return without again moving the cylinder, the teeth on the cylinder are cut away at that part of the cylinder-gear which is lowest during the period of non-rotation of the cylinder. In order that the cylinder may be brought to rest at exactly the same place at the end of every forward stroke of the bed, and enter into action with the rack exactly at the commencement of every forward stroke, it is necessary to provide the cylinder with a stopping and starting mechanism, or its equivalent. Such a mechanism usually consists of one or more cams, which, by means of one or more rollers working therewith and suitable connecting-rods, actuate a forked lever. The cams are of such shapes and the lever is so forked that the duty of the lever shall be to embrace a roller projecting from the end of the cylinder-gear as the cylinder nears the end of the stroke and is about to free itself from the rack on the bed, shall hold the cylinder, when at rest, in exactly the same position every time, in order to insure accurate register, while the bed makes its return-stroke free of the cylinder; and, lastly, shall, at the commencement of the next forward stroke, start the cylinder forward again, thereby bringing the cylinder-gear and bed-rack into action, whereupon it shall free itself from the roller on the cylinder-gear and shall return to its central position ready to take and stop the cylinder once more on the completion of its stroke. Owing to the fact that there is a large amount of energy stored in the cylinder as it nears the end of its stroke, which has to be absorbed, and that an equal amount of energy has to be imparted to the cylinder in starting it from rest and before the rack on the bed takes it, and since this energy has to be absorbed by and then given back to the cylinder by the cams moving the forked lever, it has been found by experience that the wear on the cams, rollers, levers, &c., has been very detrimental to the accurate working of the machine, thereby preventing accurate register, and injurious to the life of the machine, thereby causing frequent repairs. As the energy to be absorbed and then to be given back to the cylinder increases with the square of the velocity, and consequently the wear of parts in the same proportion, such mechanism can only be used advantageously at low speeds, thereby precluding the use of a stop-cylinder press for fast work.

The object of my invention is to remove the largest part of the strain due to the energy of the cylinder from the cams, rollers, levers, &c., and put it in a place more capable of receiving it, the result being that there is but little, if any, wear to the cams and intermediate parts; and the press can, in consequence, be run with considerable increase of speed and with a greater degree of economy. I accomplish this very desirable feature by absorbing the energy of the arriving cylinder by a cushion or buffer device, and by imparting to the starting cylinder the same amount of energy by the reverse operation. By regulating the energy taken up and given out again by the cushion or buffer the amount of strain on the cams, &c., can be made as small as can be desired, and the cams will become simply time-keepers for the cushion or buffer with reference to the cylinder. The cushion or buffer may be of any of the well-known forms, such as are used to arrest the motion of moving parts; and the style of cushion or buffer actually used on a press forms no part of my in-

vention, as a plunger working in an air-cylinder, or any one of the many styles of air, coiled wire, or other springs now in use, which are capable of absorbing the momentum of a moving body and of afterward restoring it, may be used with advantage. In the drawings I have represented the cushion or buffer as consisting of steel-wire springs coiled around rods, as such a form of cushion, I have reason to believe, is the most efficient and economical.

To further describe my invention, reference is made to the accompanying drawings, in which similar letters refer to corresponding parts.

Figure 1 of the drawings represents the general arrangement of a stop-cylinder press of the class I have reference to, with the outer frame removed in order to show more plainly the operating mechanism, and how that some of the teeth of the cylinder-gear are cut away to allow of the passage of the rack on the bed. Fig. 2 is a side elevation of the same machine with one form of my improvement applied to it. Fig. 3 is a cross-sectional elevation of Fig. 2, the line of section being taken through the cylinder, forked levers, and bed-rack pinion B^4. Fig. 4 is an end elevation of the same. Figs. 5, 6, and 7 show my improvement, as applied in Fig. 2, in some of the different positions taken during a complete stroke of the bed. Fig. 8 is a side elevation of the same press, with the lever mechanism connecting the buffer with the forked lever somewhat varied. Fig. 9 is a plan of the same with the cylinder and bed removed. Fig. 10 is a side elevation, and Fig. 11 is a plan section, of another variation in the application of my invention to the same machine, in which the buffer only acts on the cylinder in one direction.

A' A^2 are side frames; A^3, foundation; A^4, the feed-board. C' is the cylinder, having on its end the cylinder-gear C^2, part of whose teeth are cut away sufficiently to allow the bed B' to return when the cut-off part of gear C^2 presents itself to the rack B^2 on the side of the bed. C^3 is a tooth or roller projecting out from the cylinder-gear C^2, and in such a position that when the cylinder is at rest while the bed is returning the center line of the roller will be in the center of the cut-off part of the cylinder-gear and vertically below the center of cylinder. As the cylinder nears the end of its stroke the forked lever C^4, swinging about stud C^5 in side frame, A', comes forward and engages with the roller C^3. The lever C^4 obtains its motion from the cams C^8 and C^9, placed on the crank-shaft C^7, by means of the connecting-rod C^6, one of whose ends is fastened to the lower end of lever C^4 by means of stud C^{12}, and the other end embraces the crank-shaft C^7 between the two cams C^8 and C^9, and has rollers C^{10} and C^{11} projecting from its outer and inner sides, respectively, and of such size and position relative to each other that they are constantly in contact with cams C^8 and C^9, respectively. The cams C^8 and C^9 are so proportioned that by means of rollers C^{10} and C^{11}, connecting-rod C^6, and stud C^{12}, the lever C^4, swinging about stud C^5, shall, as the cylinder nears the end of its stroke, go forward, and by means of its forked end embrace the roller C^3, and, as soon as the gear C^2 and rack B^2 go out of action, gradually and gently bring the cylinder to rest with the roller C^3 always in the same position vertically under the center of cylinder, shall then hold the cylinder in that position until at such a time as the bed B' begins to go forward again, when the lever shall forcibly start the cylinder forward and shall not let go of the roller C^3 until the gear C^2 and rack B^2 come into action once more, whereupon the lever shall return to the central position of its travel ready to again go forward, embrace the roller C^3, and bring the cylinder once more to rest at the end of the stroke which it has just started it upon. The crank-shaft C^7 runs in two bearings—one, C^{13}, in side frame, A', and the other in the bracket C^{14}. Inside of bracket C^{14} and firmly keyed to shaft C^7 is the crank-gear C^{15}, which obtains its motion from the gear C^2, fastened on the main driving-shaft G' of the press. By means of a connecting-rod, C^{17}, forked at one end to embrace the bed-rack pinion B^4, and engaging at the other end with crank-pin C^{16}, projecting from the outer face of the gear C^{15}, the motion of gear C^{15} is transmitted to pinion B^4. The bed-rack pinion consists of an ordinary gear, B^4, gearing below with a rack, B^5, fastened to the foundation A^3, and above with the rack B^3, fastened to the under side of bed B', and of two flanges or rollers, B^6, of a diameter equal to the pitch diameter of the pinion, and rolling on flanges or roller-ways B^7, placed on each side of the rack and on the level of the pitch line of the rack B^5. The object of the roller-ways is to support the weight of the pinion B^4, to guide it, and to keep the pinion at the proper distances from the racks B^5 and B^3. Since the pinion B^4 meshes with a fixed rack, B^5, any amount of forward or backward motion imparted to it at its center by means of the connecting-rod C^{17} engaging the crank-gear C^{15} will produce double the amount of motion at the upper end of a diameter perpendicular to the rack; hence the bed B' and bed-rack B^3 move twice as fast as the center of the pinion B^4.

So far I have described simply the ordinary form of a stop-cylinder press, and lay no claim to any part as so far mentioned.

On the shaft of cylinder C', produced outside of frame A', is fastened a disk, D', carrying a roller, D^2, projecting from it, and in the same plane of the roller C^3 and the center line of cylinder. Embracing this roller D^2 is a slotted lever, D^3, swinging freely about the stud C^5. The slot in the lever D^3 is straight and of such length that the roller D^2 cannot come in contact with either end of it. Therefore the rotation of the disk D', carrying the roller D^2, will simply result in causing the

arm D^3 to swing forward and back from side to side. In Fig. 2 the slotted lever is shown at the extreme end of its motion, its center line being tangent to the path of roller D^2.

To the lower end of lever D^3, by means of a stud, D^{10}, is connected a rod, D^4, which, passing freely through the block D^5, is fastened to the block D^6 by a nut on each side of the latter. Blocks D^5 and D^7 are connected by two spring-rods, D^8, passing freely through D^6 and fastened to the blocks D^5 and D^7 by pins or by nuts outside of the blocks, whereby the strains on the springs may be adjusted. Around each of the rods D^8 are wound spiral springs D^{11} and D^{12}. Through the center of block D^7 passes a crank-pin, D^{13}, projecting from the outside of a disk, D^9, fastened securely to the crank-shaft C^7 outside of the frame A'. It is evident that by rotating the disk D^9 and pin D^{13} to the outer or inner end of its throw a forward or backward pressure will be exerted on the lower end of lever D^3 by means of the intermediate rods and springs, and so through the roller D^2 on disk D' to cylinder C'. As the roller D^2 nears the end of its stroke, the position of and pressure on the springs must be so arranged as to retard the cylinder and help bring it to rest; and since the springs must effectively exert their pressure in starting the cylinder in exactly the opposite direction from what they did in stopping it, mechanism must be used to reverse the direction in which the pressure of the springs is to be exerted. In Fig. 2, as has been pointed out, the lever D^3 is at the extreme end of its side motion; and as roller D^2, sliding in the slotted lever D^3, nears the lowest part of its travel, so the crank-pin D^{13} approaches the extreme point to the left of its travel. Fig. 5 represents the position of the parts as they exist when the cylinder has just come to rest. The lever D^3 has combined with pin D^{13}, to put a large amount of compression on springs D^{12}. While the bed is going back and the cylinder standing still, the pin D^{13} rotates to the position shown in Fig. 6, compressing the springs D^{11}, which, pressing on the block D^6, tend to force the lower end of D^3 into the position shown in Fig. 7, and so start the cylinder forward. In the drawings the compressing and releasing of the springs D^{11} and D^{12} is done by a crank-motion, as being the simplest way of doing it; but a better result can be obtained by replacing the disk D^9 and pin D^{13} by a properly-shaped cam and rollers. Such a cam has the advantage over the crank-motion that the amount of compression can be varied, and can be more accurately and quickly brought into action at the right time. In Figs. 8 and 9 the same arrangement is carried out with the exceptions that the disk D^9 and the crank-pin D^{13} are replaced by an eccentric, D^9; that the springs are placed inside, and so more out of the way; and, lastly, that instead of D^3 being connected to D^4 by one stud, D^{10}, motion is transmitted from a bent slotted lever, D^3, by a connecting-rod, D^{14}, to an arm, D^{15}, fastened on the outer end of a shaft, D^{18}, having one bearing in the frame A', and the other in the bracket D^{17}, and by a lever, D^{16}, fastened to shaft D^{18}, and connected to rod D^4. The chief advantage of this form of my invention consists in the springs being inside of the frames, and so out of the way while manipulating the press in printing.

It is easily seen how the same principles and ideas might be arranged in a great variety of ways to suit the requirements of each and every individual press; but it is needless to point them out any further than has already been done.

As it is possible, of course, to use my device only in stopping the cylinder, or only in starting it, I have shown in Figs. 10 and 11 my improvement as arranged for starting the cylinder from rest. It will be noticed that it is shown as acting on the inner connecting-rod, which conveys motion from the cams C^8 and C^9 to the forked lever C^4. The mechanism consists of the rods D^8, having the starting-springs D^{11} coiled about them, fastened, as in Fig. 2, to blocks D^5 and D^7, and passing freely through block D^6. Block D^7, instead of being fastened to a crank-disk, obtains its motion by carrying on its prolonged part a roller, D^{15}, acting with the cam D^{11}, attached to the crank-shaft C^7. The block D^6 is fastened to an overhanging projection of connecting-rod C^6. From the foregoing description the *modus operandi* is easily perceived. I am fully aware that stop-cylinder presses are made in which a large amount of the energy of the arriving cylinder is absorbed by an ordinary friction brake or shoe, thus easing the strain on the cams C^8 and C^9, and thereby somewhat preventing any excessive wear on that part of them which stops the cylinder. Any of the above-described arrangements may be used with the brake device, and so aid, not only in stopping the cylinder, but also in starting it again; or some one of the above arrangements may be used to simply start the cylinder while the brake is used to stop it.

As has been said before, I do not confine myself to the particular kind of cushion, buffer, or spring, as shown in the drawings, as each one and all of the various styles and kinds of air, rubber, coiled wire, or other springs, cushions, or buffers now in use which are capable of absorbing the momentum of a moving body and of afterward restoring it are applicable to and may be used with advantage on my device, nor yet to the particular kind of lever arrangement herein shown.

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

1. The combination, with the cylinder of a stop-cylinder printing-press, of a series of springs, or equivalent cushioning device, substantially as described, together with a crank, or an equivalent cam with one or more rollers, and also suitable and proper connecting mechanism, substantially as shown, and so arranged

as to help to relieve the pressure on the cams which stop and start the cylinder, substantially as shown.

2. The combination, with the cylinder of a stop-cylinder printing-press, of a disk, D′, on cylinder-shaft, roller D^2, slotted lever D^3, working therewith, connecting-rod D^4, together with a series of springs or equivalent cushioning device, substantially as described, the connecting-piece D^7, the crank-disk D^9, and pin D^{13}, or an equivalent cam with one or more rollers, substantially as described, and for the purpose set forth.

3. The combination, with the crank-disk D^9 and pin D^{13}, or an equivalent cam with one or more rollers, together with connecting-piece D^7, of a series of springs or an equivalent cushioning device, substantially as described, connecting-rod D^4, lever D^3, studs D^{10} and C^5, and having for its object the changing of the direction of the effective pressure of the springs or cushioning device, substantially as described.

BERTHOLD HUBER.

Witnesses:
ELLEN M. LUCAS,
WM. F. MAGRUDER.