(No Model.) 4 Sheets—Sheet 1.

F. GRINNELL.

MACHINE FOR TAPPING PIPE FITTINGS.

No. 311,311. Patented Jan. 27, 1885.

Fig. 1.

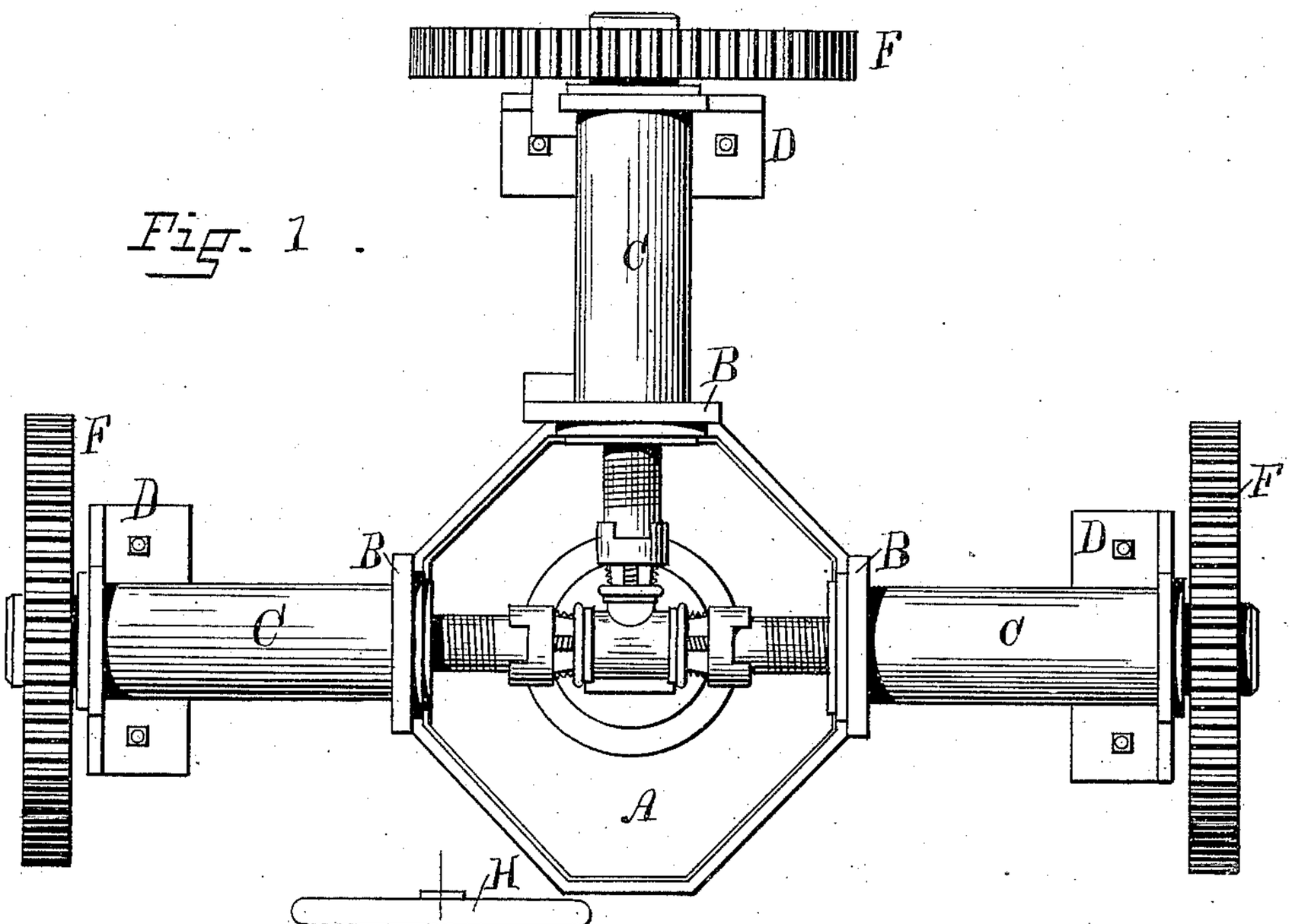

Fig. 2.

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Fig. 3.

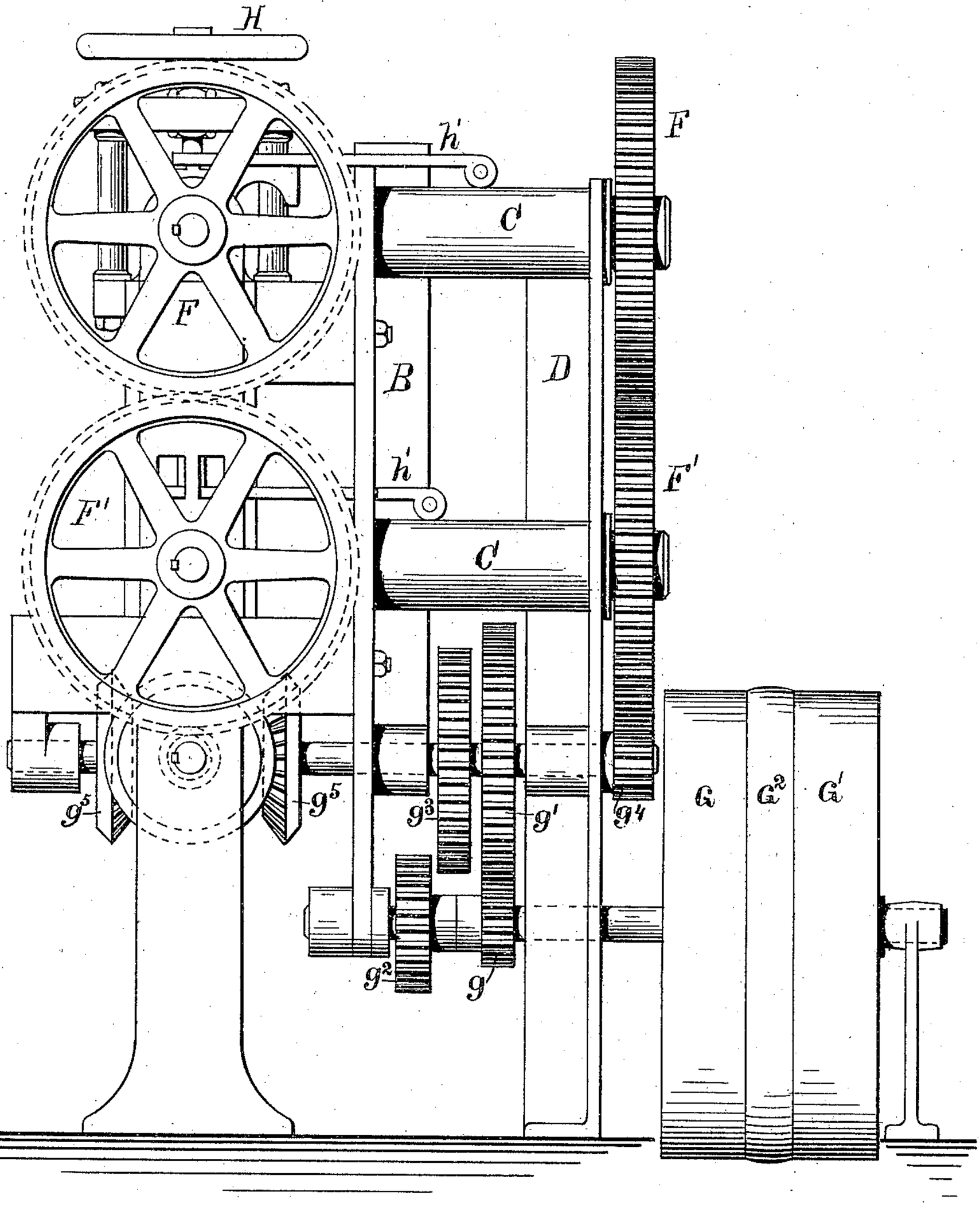

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Fig. 4.

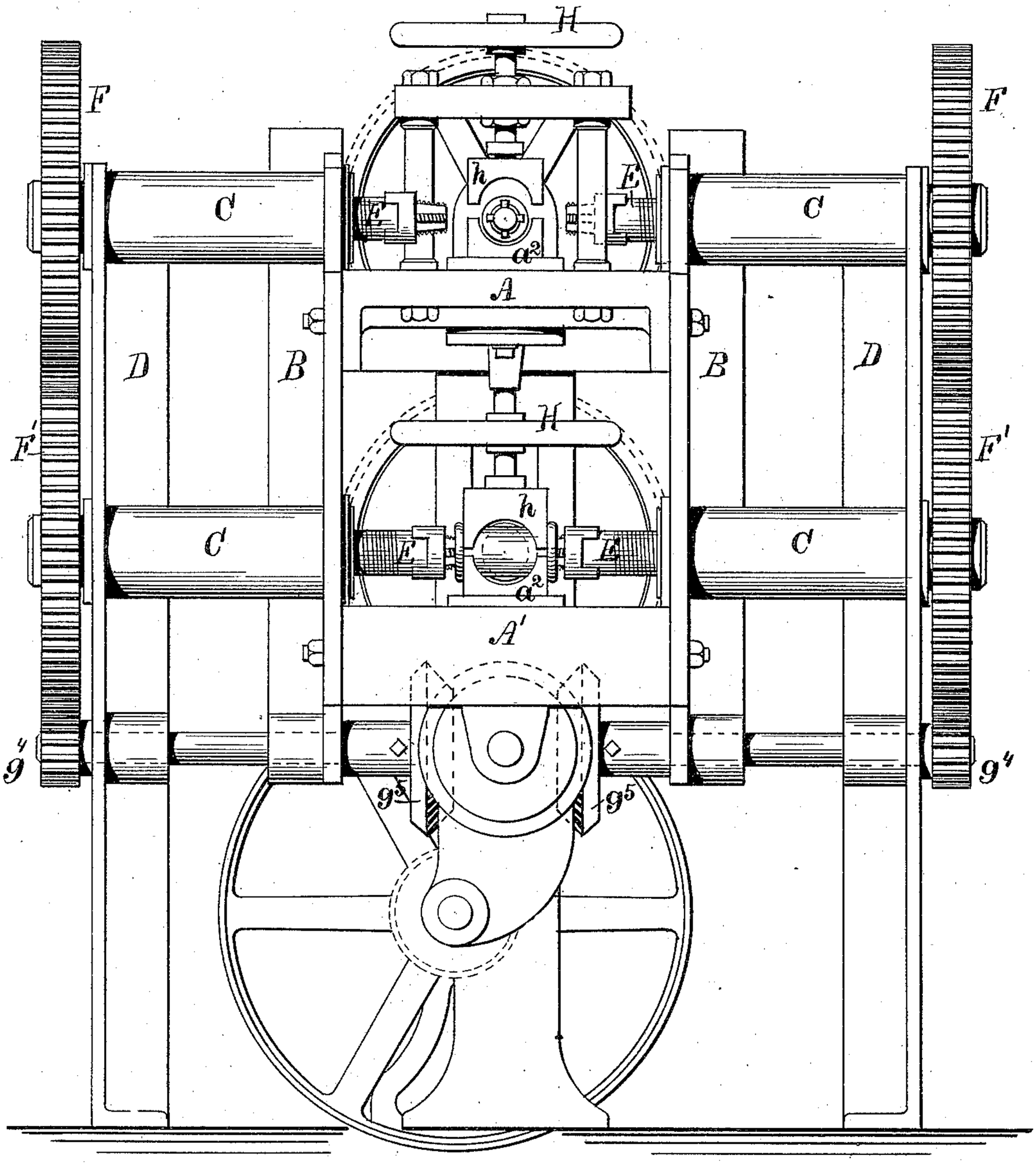

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Fig. 6.

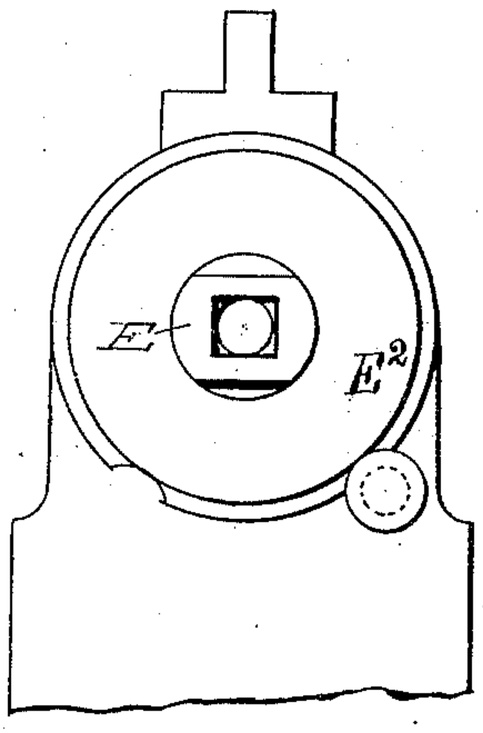


Fig. 5.

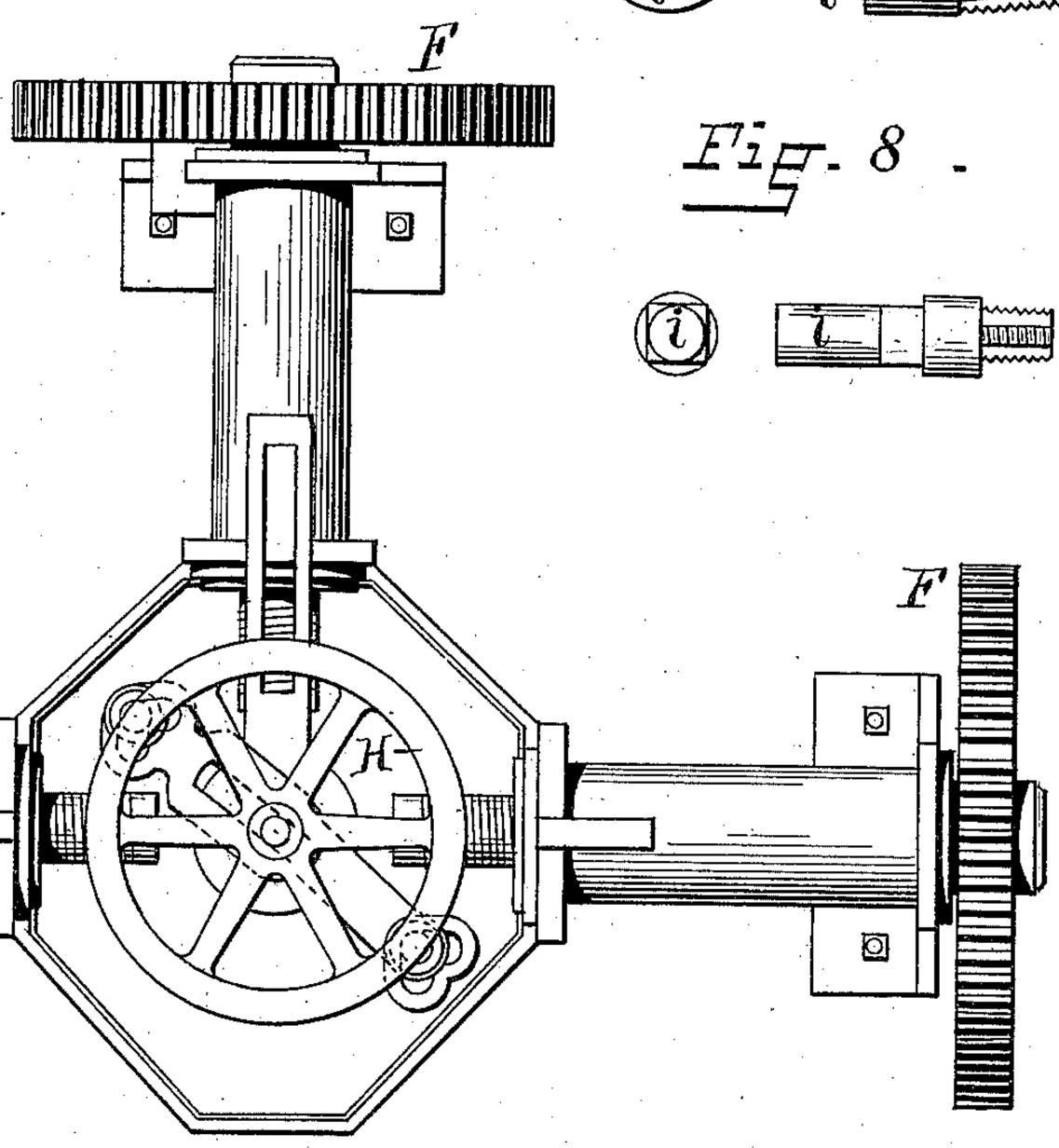


Fig. 7.

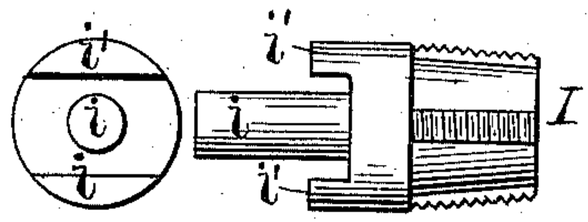
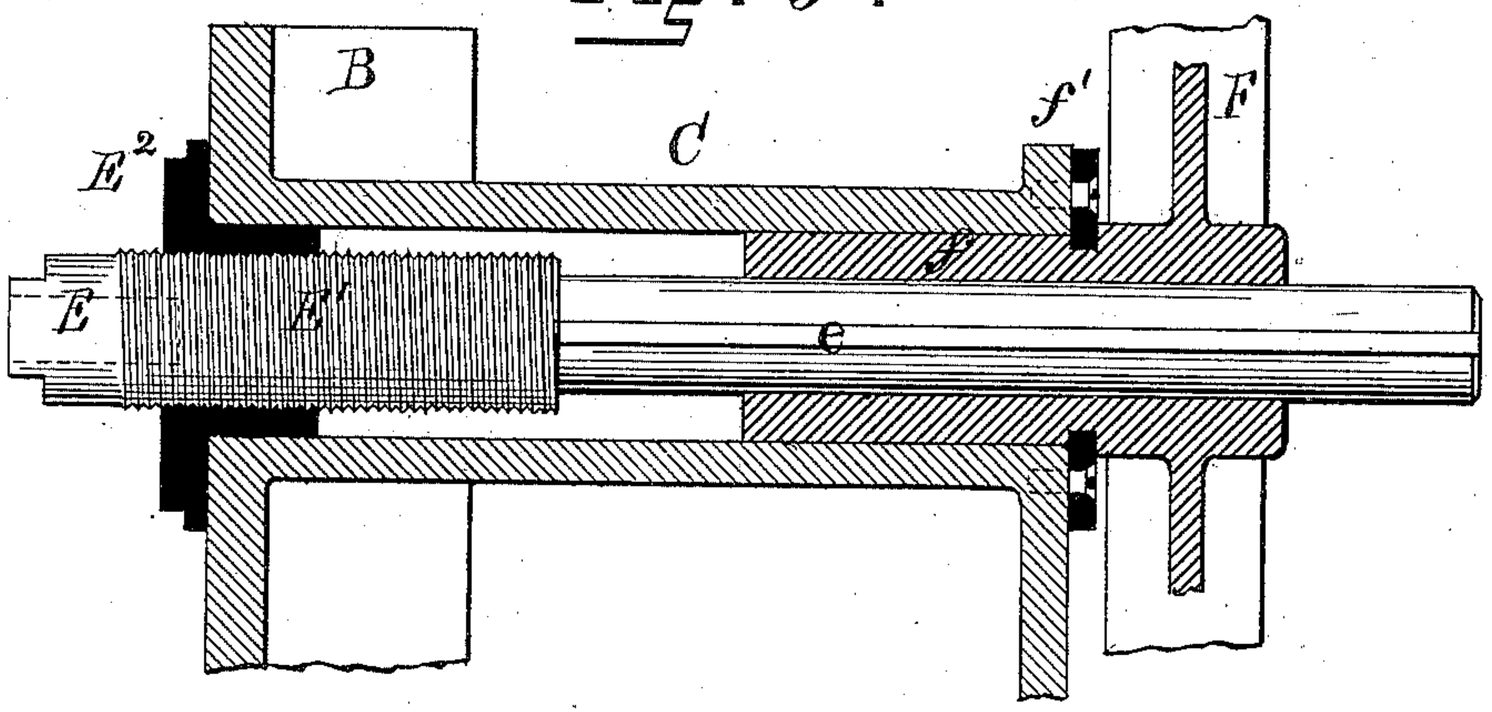


Fig. 8.

Fig. 9.



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UNITED STATES PATENT OFFICE.

FREDERICK GRINNELL, OF PROVIDENCE, RHODE ISLAND.

MACHINE FOR TAPPING PIPE-FITTINGS.

SPECIFICATION forming part of Letters Patent No. 311,311, dated January 27, 1885.

Application filed March 3, 1884. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK GRINNELL, of the city and county of Providence, State of Rhode Island, have invented a new and useful Improvement in Machines for Tapping Pipe-Fittings; and I hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to machines for boring and tapping fittings for pipes, such as elbows in which two screw-threads of the same or different size are cut at right angle to each other, T-pieces in which the three outlets are tapped with screw-threads to receive three pipes of the same or different diameters, and other similar fittings having more than one outlet or screw-threaded opening into which pipe is to be secured.

The invention consists in the peculiar and novel construction of the machine, by which greater accuracy in the screw-thread and simplicity of construction are secured, as will be more fully set forth hereinafter.

In the various fittings used to connect steam and water pipes, the screw-threads must be cut with the greatest possible care, for in these fittings not only must the screw-connection be able to sustain the usual strain incident to other screw-connections made in rods or other devices, but these screw-connections must make a tight joint able to sustain very high internal pressure in the pipes without the slightest leakage, and also able to remain tight under varying strains for an indefinite length of time. Where, in a fitting-piece, two or more outlets are to be tapped or threaded, it becomes desirable to perform the operation simultaneously, and for this purpose machines have been heretofore constructed in which two or more outlets in the same fitting-piece have been tapped at one time; but in such machines the screw-threads were always liable to be cut imperfectly, owing to the spring of the machine and the wearing of the surfaces of the moving parts, the thrust-bearings of the mandrel and the bearings for the leading-screw by which the tap is fed were too far from the work, and the feed would at times vary, as greater or less strain was exerted in cutting the thread.

One object of this invention is to overcome this difficulty by securing the thrust-bearing and leading-screw as close as possible to the tap and unite the several thrust-bearings by a strong and substantial plate on which the fitting to be operated upon is secured. The tapping of two or more outlets in pipe-fittings, and particularly when they are of large diameter, requires a great deal of power, the sudden applying and as sudden releasing of which power greatly strains not only the parts of the machine, but the shafting and connections by which the power is conveyed.

Another object of this invention is to avoid such strain and make the application of power to this machine practically uniform by constructing the same with two sets of mandrels, two sets of holding devices, and two sets of gears, arranged so that while the taps of one set are cutting the threads the taps of the other set are running back, and two fittings are operated upon simultaneously.

Other objects of this invention are to hold the fittings securely against the twisting strains due to the operation of the machine, and to enable the machine to perfectly sustain the excessive strains to which such machines are subjected.

Figure 1 is a plan view of the machine, showing the three mandrels supported in sleeves connected directly to the central plate forming the support for the fitting. Fig. 2 is a sectional view of the machine, showing the two sets of tapping-mandrels. Fig. 3 is a side view of the machine, showing the gearing by which the power is applied to the two sets of mandrels in opposite directions. Fig. 4 is a front view of the machine. Fig. 5 is a top view of the machine, showing the hand-wheel for securing the fitting. Fig. 6 is an end view of the mandrel. Fig. 7 is an end and side view of the larger taps. Fig. 8 is an end and side view of the smaller taps, and Fig. 9 is a sectional view of the sleeve in which the leading-screw, the mandrel, and driving-gear are supported.

In the drawings, A is the upper and A′ the lower table on which the pipe-fittings are supported. These tables are of such size as will allow of the larger size fittings being operated upon. They are made of great strength and provided with the flanges *a a*, accurately

planed to fit against the planed faces of the standards B B, to which they are firmly and rigidly bolted. A standard, B, sleeves C C, and a standard, D, are formed in one piece, three of which are used to support the machine, all three being firmly bolted to three sides of the tables A and A′, forming a tripart support for all the working parts of the machine, and leaving the front open and unobstructed, so that the operative can attend to both sets of the tapping devices with great facility. The tables A and A′ are provided with a raised rim to form a receptacle for the oil that is continually flowing on the taps, and they are connected by means of pipes with a well, from which the oil, after being strained, is again supplied by a pump.

For the purpose of accurately centering the pipe-fittings quickly, the tables A and A′ are provided with sockets, into which the stems of the bolsters a^2 are placed to receive the fitting, and thereby insure the same of being placed exactly on the line with the axes of the three mandrels, both laterally and horizontally. The mandrel in the ends of which the taps are secured is provided with the screw-thread E′, having the exact pitch of the thread on the taps, so that on turning the mandrel in either direction the tap is fed to its work true and fair to cut the required thread into the fitting. The screw E′ is threaded in the nut E^2, which is secured in the sleeve C, and bears against the face of the standard B. The thrust of the mandrel is therefore near the end of the mandrel, and as close to the fitting-piece to be operated upon as is compatible with the working of the machine, and the thrust-bearing is practically rigidly secured to the tables A and A′, thereby obviating all possibility of lost motion, spring in the machine, or cross-threading in the fitting.

The mandrel E is provided with the spline *c*, which enters a groove in the hub *f* of the driving-gear F, which has its bearing in the sleeve C, and is held in place by the ring *f*′, made in two halves, as is shown in Fig. 9. The mandrel E is therefore turned by the gear F, and is free to move endwise, guided by the screw-thread E′.

The mandrel E and nut E^2 may be quickly removed and another arbor and nut inserted, or the screw-thread E′ may be formed on a sleeve which is secured to the mandrel E, so that in exchanging one screw and tap for another the mandrel proper does not require to be removed.

The machine is driven by means of an open belt placed on the pulley G and a cross-belt on the pulley G′, either one or the other being, when the machine is running, on the loose pulley G^2; but this arrangement for reversing the motion may be placed on a counter-shaft or arranged in any other of the well-known methods for driving machines, at pleasure, in opposite directions.

Secured to the driving-shaft is the small pinion *g*, gearing into the gear *g*′, for driving the machine in its normal work, and also the larger gear g^2, gearing into the gear g^3, when the machine is required to be run at a higher speed.

At one end of the shaft carrying the gears *g*′ and g^3 is the pinion g^4, gearing into the gear F′, and at the other end the beveled gear g^5, gearing into three similar gears, two of which drive a shaft, on the opposite end of which is also a pinion, g^4, gearing into the gear F′, and through the same into the gear F, so that the six mandrels are all driven simultaneously, the fourth beveled gear, g^5, being an idle gear.

H H are the hand-wheels by which the screw for holding and clamping the fitting is operated.

h h are the upper bolsters for securing the fitting.

Elbows and T-fittings are difficult to firmly hold in place, as from various causes one of the taps is liable to cut the metal before the other or others, and thereby exert a twisting strain, which is not only liable to turn the fitting, but to bend the screw by which it is held. To avoid this I use the slides *h*′ *h*′, which, passing through slots in the standard B, rest on the sleeves C C, as is shown in Figs. 2 and 3. These slides are provided with stops which rest upon the sleeves, and the body portion of each of which is inserted between the screw and the bolster, as is shown in Fig. 2, so that said slides act as anchors when inserted between the screw and the bolsters *h*, and take up all the strain caused by the entering of one tap before the others, or unequal resistance in the tapping. As all the threads cut simultaneously into the fittings are right-hand threads, there would be no tendency to twist the fitting if the castings could be at all times perfect, for the strain of one tap counteracts the strain of the other; but it is impossible to secure such perfection in the castings, and therefore the slides *h h* not only act to secure the fittings more firmly, but prevent the excessive strain on the screw.

To firmly secure the large tap I (shown in Fig. 7) in the mandrel, the same is provided with the cylindrical spindle *i* and the projecting shoulders *i*′ *i*′, and the end of the mandrel is counterpart of the end of the tap, so that the shoulders fit over the same. The smaller tap, I′, (shown in Fig. 8,) requires no such extra security, and is therefore provided with the spindle *i*, on which a square shoulder is formed near the tap, which fits into a square hole in the end of the mandrel.

By the peculiar construction of the machine all the strain is practically confined to the tables A A′, and but little strain exerted on the other parts of the frame of the machine. The alignment of the mandrels, the strain on the same, and the whole stability of the machine are dependent on the tables. When these are of sufficient strength and the standards firmly bolted to the same, the machine will

resist, without the slightest yield, any strain that can be required in the work it is built to perform.

As the bolsters are each held in position by a stem which fits freely in a socket in the table, they are adapted to readily adjust themselves automatically for the purpose of bringing the fittings into alignment with the taps, and as the sleeves which carry the taps are securely attached to standards, which are in turn securely attached to the tables A A′, the thrust of the mandrels and taps is borne by said tables, and the thrust-bearings may be properly defined as secured to the tables. The slides h' rest at their outer ends, which act as stops, upon the sleeves C, and are interposed at their body portion between the bolsters and bolster-screws, for the purpose of distributing the pressure of the bolster-screws upon the sleeves and bolsters for the purpose of preventing any wabbling or unsteady movement of the fittings during the action of the taps.

It is obvious that various modifications may be made in the details of the construction of the mandrel without losing the peculiar benefits derived from the peculiar and novel arrangement shown and described.

By the use of the double-deck machine described one set of taps is always cutting the thread while the other set is being withdrawn, and, as the two fittings operated upon are one above the other, one operative can easily attend both sets of taps, thereby doubling the amount of work; but independent of this the vertical construction and the use of the two tables to which the frames are secured insure greater stability and require less room than other machines.

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

1. The combination, with the machine-frame composed of the standards, the tables, and the sleeves, of the thrust-bearings or nuts secured to the inner ends of said sleeves, and the mandrels supported in said bearings, as and for the purpose described.

2. The machine-frame composed of the standards B D, the tables A A′, and the sleeves C, substantially as and for the purpose set forth.

3. The combination, with the frame composed of the standards B D, the tables A A′, and the sleeves C, of the mandrels, the nuts or thrust-bearings, and the driving-gears, all constructed and arranged to operate substantially as specified, so as to constitute a double-decked machine having its tapping mechanism arranged in two sets, one above the other.

4. The combination, with the machine-frame composed of the standards B D, the tables A A′, and the sleeves C, of the thrust-bearings or nuts, the mandrels E, and the shafts carrying the pinions g^4 and gears g^5, F, and F′, arranged, as described, so as to turn the two sets of taps in opposite directions, for the purposes stated.

5. The combination, with the machine-frame, constructed as described, of the nuts or thrust-bearings E^2, located at the inner ends of the sleeves of the frame, the screw-threaded mandrels E, and the gears F F′, constructed and arranged to operate as described.

6. The combination, with the frame composed of the standards, tables, and sleeves, of the thrust-bearings or nuts located at the inner ends of said sleeves, the mandrels having the leading-screws, and the bolsters held in sockets in the tables and arranged to automatically center the fittings, as described.

7. The combination, with the frame composed of the standards, tables, and sleeves, of the bolsters h, the screws therefor, and the slides h', resting upon said sleeves and interposed between the bolsters h and their screws, as and for the purposes described.

8. The combination, with the sleeve C and the mandrel E, provided with the screw-thread E′ and spline e, of the nut E^2, secured in the sleeve and bearing against its face, and the gear F, provided with the hub f, extending into the sleeve C, and constructed to turn the mandrel, as described.

9. The combination, with the three-part frame composed of a series of standards, sleeves, and two tables, arranged one above the other, of a holding and a thread-cutting mechanism for each table, and gearing for driving the mandrels of each set of thread-cutters in opposite directions from the other set and from a single driving-shaft, substantially as described.

10. The combination, with the frame composed of the standards, tables, and sleeves, of the bolsters and bolster-screws, the slides, nuts, or thrust-bearings, mandrels with leading-screws, the gears F F′, the driving-shaft carrying the gears g g^2 and pulleys G G′ G^2, and the shafts carrying the gears g', g^3, g^4, and g^5, as and for the purposes described.

11. The combination, with the bolsters and screw for holding the fitting, of the slide h', extending to and resting upon a fixed part of the frame and bearing upon the bolster, substantially as and for the purpose specified.

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