2 Sheets—Sheet 1.

F. GRINNELL.

PIPE-DRILLING MACHINE.

No. 169,354. Patented Nov. 2, 1875.

Fig: 1.

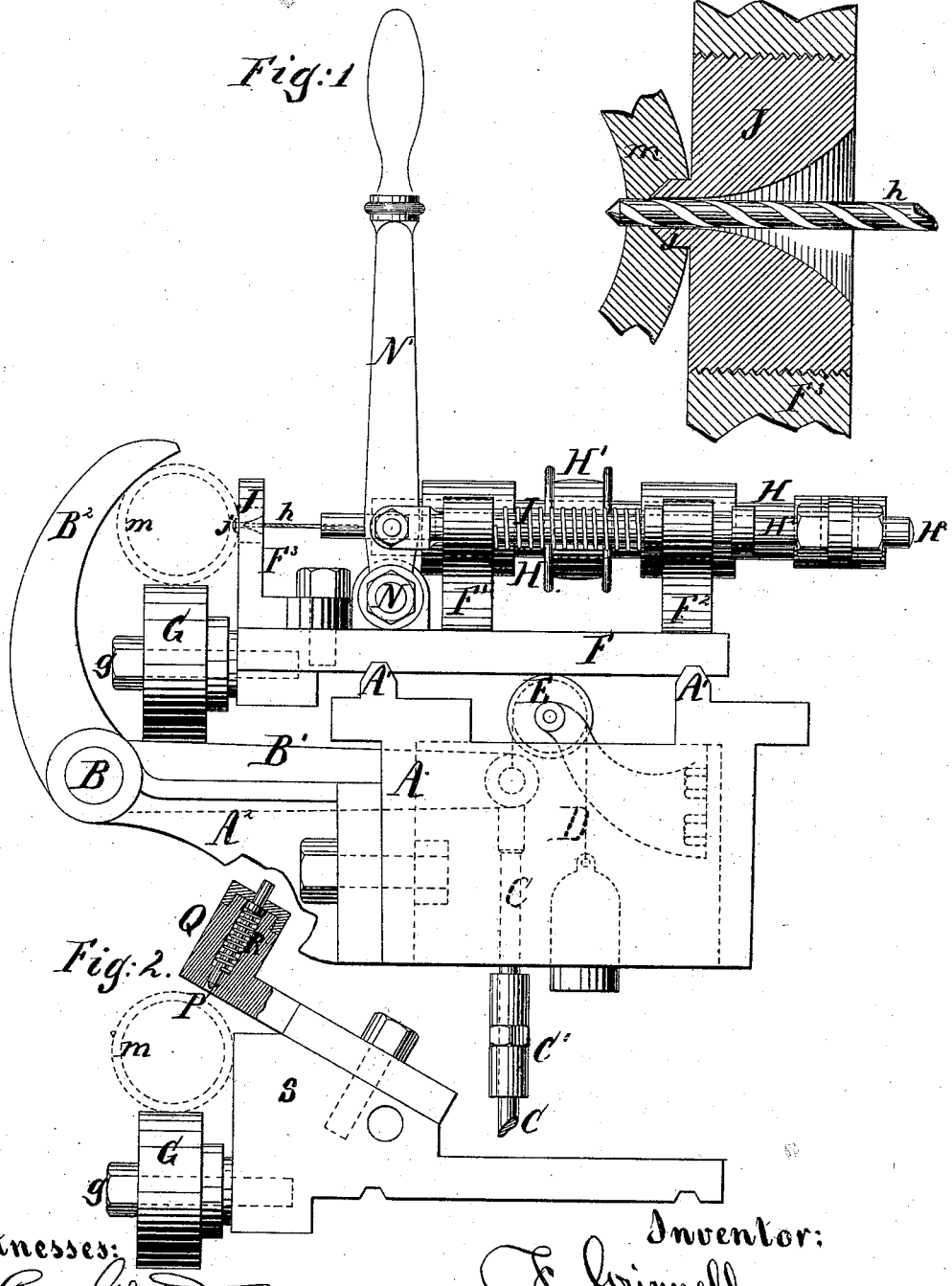

Fig: 2.

Fig: 1ª.

Witnesses:

Henry Gentner

W. E. Dey

Inventor:

F. Grinnell

by his attorney

Thomas D. Stetson

2 Sheets—Sheet 2.

F. GRINNELL.

PIPE-DRILLING MACHINE.

No. 169,354. Patented Nov. 2, 1875.

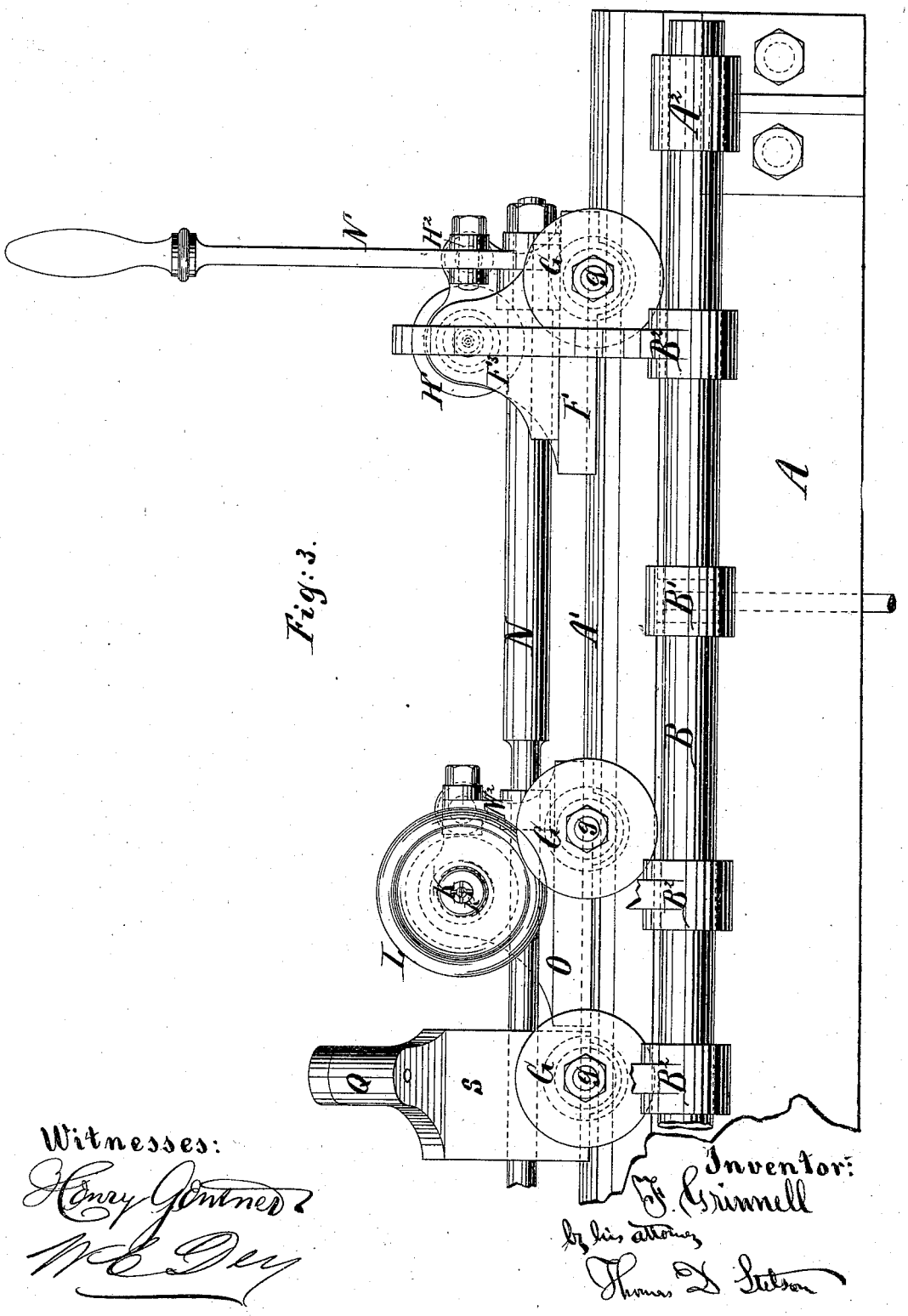

Fig. 3.

Witnesses:

Henry Gontner

W. E. Dey

Inventor:

F. Grinnell

by his attorney

Thomas D. Stetson

UNITED STATES PATENT OFFICE.

FREDERICK GRINNELL, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN PIPE-DRILLING MACHINES.

Specification forming part of Letters Patent No. **169,354**, dated November 2, 1875; application filed June 15, 1875.

To all whom it may concern:

Be it known that I, FREDERICK GRINNELL, of Providence, in the State of Rhode Island, have invented certain new and useful Improvements relating to Machinery for Drilling Pipes, of which the following is a specification:

The machine drills at the same time a hole at one point with a large drill through something more than half the thickness of the pipe, and at another point drills a smaller hole, which continues the large hole bored partially through at a previous operation, and thus makes a small hole extending through to the interior of the pipe. It also provides for marking with a prick-punch at certain early stages of the operation, clamping the pipe strongly and liberating it rapidly at will, sustaining the smaller drill laterally against any disturbing force, and also guiding it very accurately into the bottom of the partial hole previously bored.

The following is a description of what I consider the best means of carrying out the invention: The accompanying drawings form a part of this specification.

Figure 1 is an end view of the parts connected with the drill for boring the small hole. Fig. 2 is an end view of certain portions with a cross-section through the prick-punch and the adjacent parts. Fig. 3 is a front view of the entire main portions of the machine. Fig. 1^a is a section, showing on a larger scale the guide surrounding the small drill.

Similar letters of reference indicate like parts in all the figures.

A is a fixed frame of cast-iron or other suitable material. It is formed with ways A^1 A^1, upon which may be adjusted carriages to support the arbors of the drills, and the bearings of the prick-punch, with holding-bolts, (not represented,) or other ordinary means for adjusting them firmly in position thereon, as may be required. Brackets A^2 support a shaft, B, formed with an arm, B^1, which is connected by a rod, C, having an adjustment, C′, to a treadle (not represented. This arm B^1 is elevated by means of a weighted cord, D, running over a pulley, E. The other arms B^2, fixed on the shaft B, are adapted to press firmly against the tube, represented in dotted lines in Fig. 1, whenever the treadle is depressed. The pipe is supported upon rollers G turning upon fixed studs *g*. These rollers G should be exchanged when a different size of tube is to be treated, the exchanges being made so as to hold the axes of all sizes of tubes at the same elevation, just level with the centers of the arbors of the drills.

The pipe is introduced at one end of the machine when the pressure of the treadle is relaxed. In this condition the weighted cord D elevates the arm B^1 and throws outward the arms B^2, so that it is easy to move along the pipe supported on the rollers G, and with the overhanging ends supported on additional rollers (not represented) at the ends of the machine. The pipe is alternately fed forward, griped, and drilled, the drilling being effected simultaneously at two points.

Figs. 1 and 1^a represent the smaller drill and the parts which operate and guide it. H is the arbor, provided with a pulley, H′, receiving a belt driven from some shaft (not represented.) It is supported in bearings F^1 F^2 on the adjustable carriage F, and carries a drill, *h*, which may be one of the most delicate twist-drills. A shaft, N, extends longitudinally on the machine. Fig. 1 shows a support therefor on the carriage F, and there is a corresponding support on each of the other carriages. A hand-lever, N^1, fixed on the shaft N gives a rocking motion thereto when desired. A rod, H^2, connects from the lever N^1 to the shaft or arbor H. When the hand of the operator is applied to the lever N^1, and it is moved forward, thereby rocking the shaft N, it, by means of the rod or link H^1, moves forward the shaft H, and consequently the drill *h*. A coiled spring, I, moves these parts back to their first position when the handle N^1 is released.

The drill *h*, when moving forward, is surrounded by a bushing, J *j*, of hardened steel, having a funnel-shaped aperture, adapted to receive the drill. This bushing is threaded through a standard, F^3, fixed adjustably on the carriage F. On the outer face of this bushing is a projection, *j*, which is exactly concentric to the small hole through which the drill *h* plays, and is formed of a contour cor-

responding to the partial hole which has been previously drilled in the tube. The tube is fed forward by hand, and the exactly right position is determined by the attendant, who fits or matches the partially-drilled hole on the projection *j*. Thus constituted, the force of the foot, applied on the treadle, depresses the arm B^1 and clamps the tube firmly. Then movement of the handle N^1 presses forward the smaller drill *h* and completes the hole.

I esteem it not necessary to show a side view of the larger drill and its shaft. An end view is shown at *k*, in Fig. 3. Its arbor is moved forward by a link or rod, n^2, connected to an arm, N^2, so that the rocking of the shaft N moves forward the large drill *k* at the same time that it moves forward the small drill *h*. The drill *k* is held firmly by a nut, which is formed with a large hand-wheel, L, serving both as a fly-wheel and as a convenient means of tightening the hold upon the drill. The drill is held in the arbor by screwing the nut upon a taper end of the arbor, which is sawed across, or otherwise split, to allow the forcible contraction of the drill by the action of the nut. The drill is purposely made short, and is very rigidly held to the arbor. The hand-wheel L, rotating at a high velocity close to the point where the large drill *k* is acting, serves an important function by steadying the said drill to resist any disturbing effect induced by inequalities in the hardness of the iron. The carriage O, which supports the shaft of the large drill, is adjusted at just a proper distance from the carriage F, which supports the small drill, to correspond with two or some other number of intervals between the holes. P is a prick-punch, mounted upon a housing, Q, and held up by a coiled spring, R. The housing Q is supported on a carriage, S, which is adjusted in such position that the horizontal distance between the prick-punch P and the large shaft K is just equal to the distance between two adjacent holes in the pipes.

I will describe the operation minutely. Each pipe to be drilled is introduced from the left, and the first operation after relaxing the treadle is to draw the pipe forward until its end is a little past the axis of the large drill *k*. Then, after depressing the treadle and griping the pipe firmly by the arms B^2, the lever N^1 is drawn forward by the attendant, and the large hole is thus drilled partially through the pipe, an operation which may be termed countersinking.

Simultaneously with this operation, or immediately before or after it, a blow is struck by the attendant with a wrench or other suitable object upon the head of the prick-punch P, causing a distinct indentation or prick-punch mark on the pipe. Now, after relaxing the treadle, and thus releasing the hold of the griping-arms B^2, the pipe is moved by the attendant forward one space, and is turned partially on its axis, so as to bring the punch-mark opposite the large drill. Then it is again griped, and the hand-lever N^1 and its connections are again moved forward, thus countersinking or partially drilling the second hole. Another blow is struck on the prick-punch P, while the pipe is in this position, thus marking the place for the third hole. Thenceforward there is no longer occasion for operating the prick-punch. Again, the gripe is relaxed and the pipe moved forward, and the prick-punch mark last made is availed of to determine the place to be presented to the large drill *k*, which done, the lever N^1 is again operated, and this point is countersunk. Now, on again relaxing the hold and once more moving forward the pipe *m*, it should be turned more than before, so as to complete a revolution. Rightly conducted, this fourth movement brings the first partially drilled or countersunk hole in front of the bushing J, and the operator takes care to match it upon the projection *j* thereof. This gages the position of the pipe. At each subsequent movement, the matching of the previously partially drilled hole upon the projection *j* serves to gage the place for the next operation with absolute precision. At each movement of the lever N^1 the small drill *h* completes a hole, and the larger drill *k* commences a new one. The machine, thus organized, drills three series of holes in right lines, at a mathematically exact angle relative to each other, and this, even if the pipe is more than usually crooked and irregular. It should be remarked that the shaft B and the arms B^2, as also the treadle and its connections for operating it, should be sufficiently strong to spring the pipe temporarily into a right line during the period while it is being drilled. The bushing J *j* is attached to the support F^3, and can be removed and a new one substituted as often as desired.

I find by practice, that a delicate drill, *h*, will serve a long time in this machine, partly because it has only a little distance to bore, and partly because the scale or hard surface is all removed from the iron by the action of the large drill, and it finds only the soft interior of the iron before it to work on. The bushing J *j* should not touch the drill but comes very near it and serves to protect it.

The method or process of drilling sprinkling-pipes by the machine herein described has been made the subject-matter of a separate application for a patent.

I claim as my improvements in machines for drilling pipes—

1. In combination with means B^2 for holding and releasing the pipe *m*, the small drill *h*, and the larger drill *k*, connected as shown, and operated at a single motion, substantially in the manner herein specified.

2. The bushing J *j*, adapted to enter the partially drilled hole and determine the position of the pipe, and having a concentric aperture adapted to receive the drill *h*, as herein specified.

3. The prick-punch P, mounted as shown,

in combination with the drills *k* and *h*, and their impelling and operating means, substantially as and for the purpose herein specified.

4. The fly-wheel L, in combination with the drill *k*, and adapted to serve both as a means of steadying the drill in operation, and of confining and releasing it, as herein specified.

5. The combination of the supporting-rollers G, clamping-arms B^2, lateral support F^3, and drills *k h*, and their driving means, the several portions serving relatively to each other as and for the purposes herein specified.

In testimony whereof I have hereunto set my hand this 11th day of June, 1875, in the presence of two subscribing witnesses.

FREDERICK GRINNELL.

Witnesses:
F. H. MAYNARD,
F. W. HARTWELL.