

(No Model.)

2 Sheets—Sheet 1,

D. GOODWILLIE.  
LUMBER DRIER.

No. 293,961.

Patented Feb. 19, 1884.

FIG. 1.

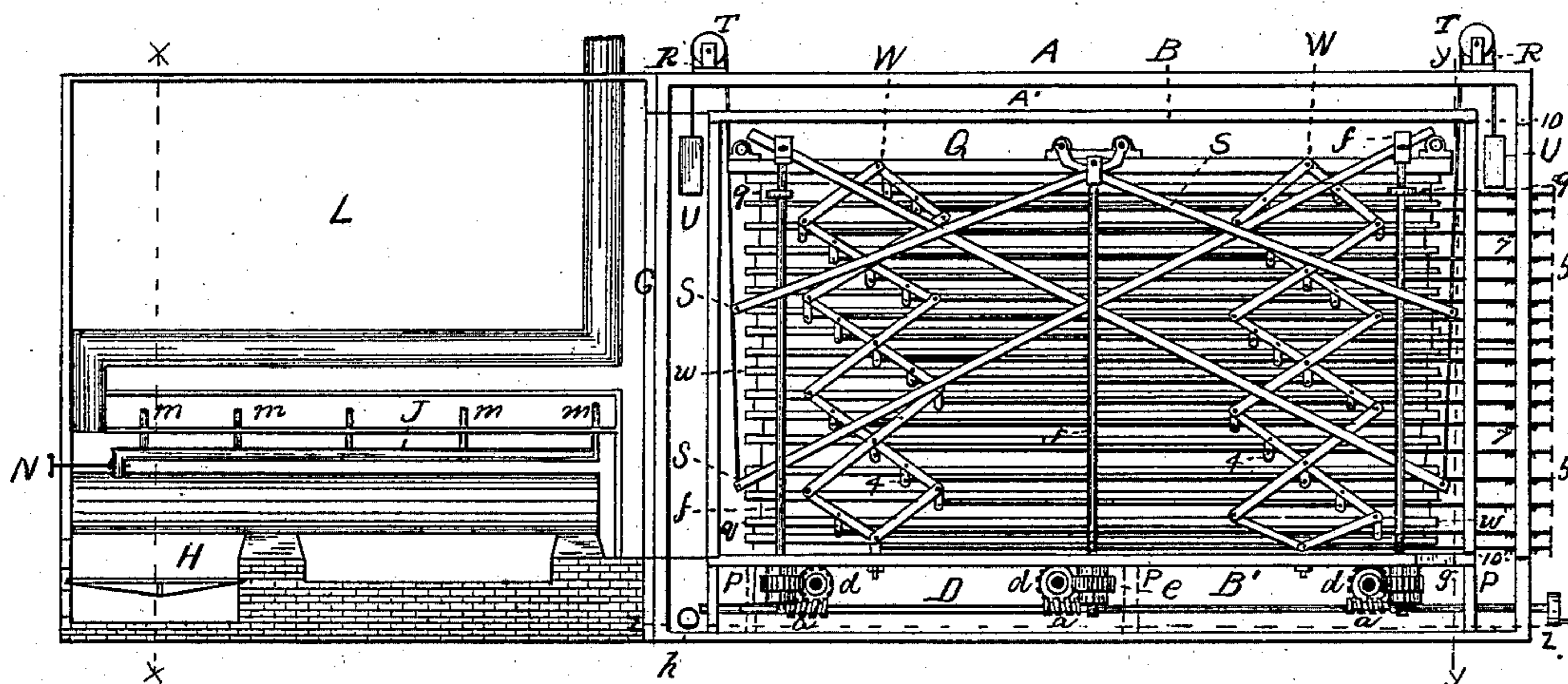


FIG. 2.

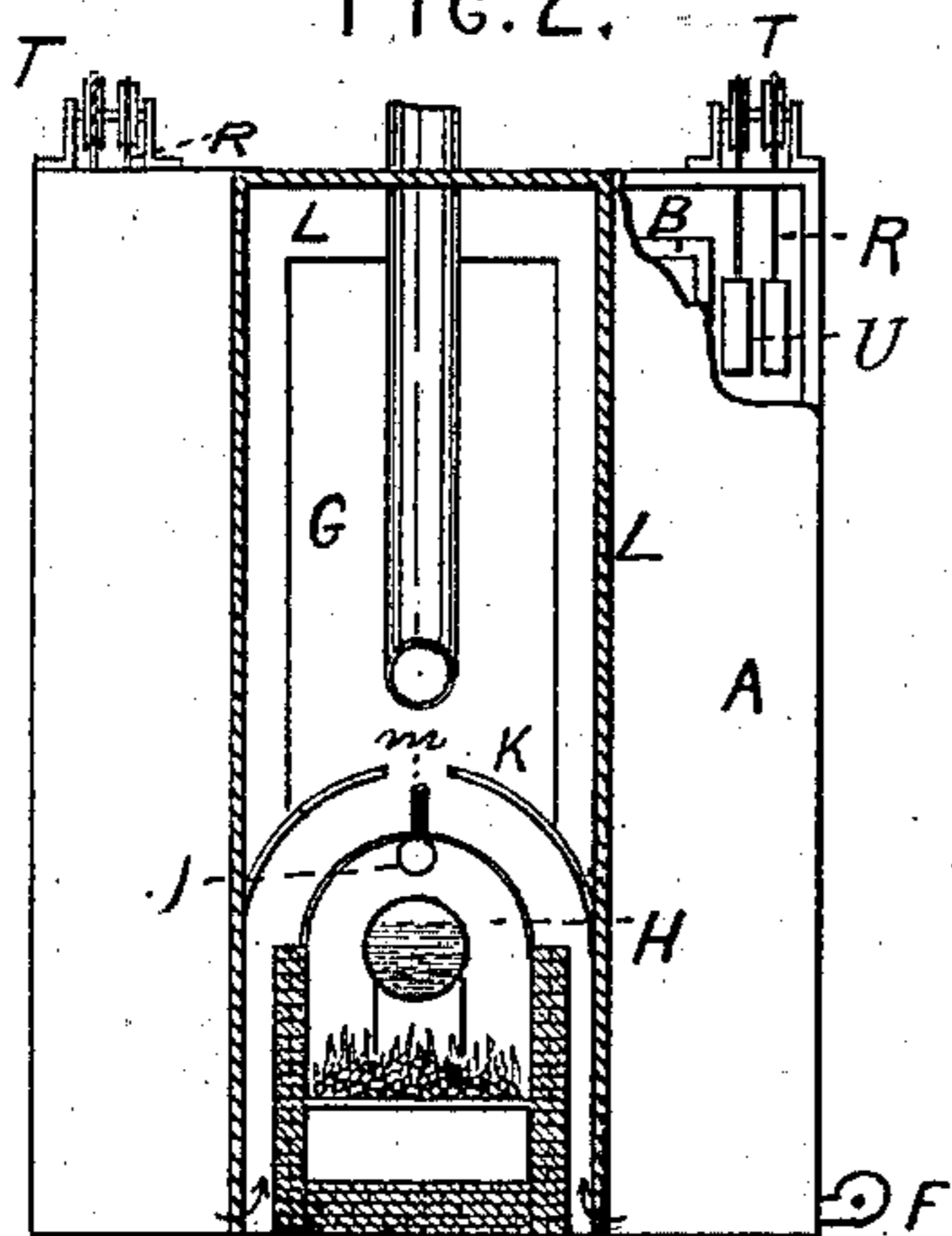
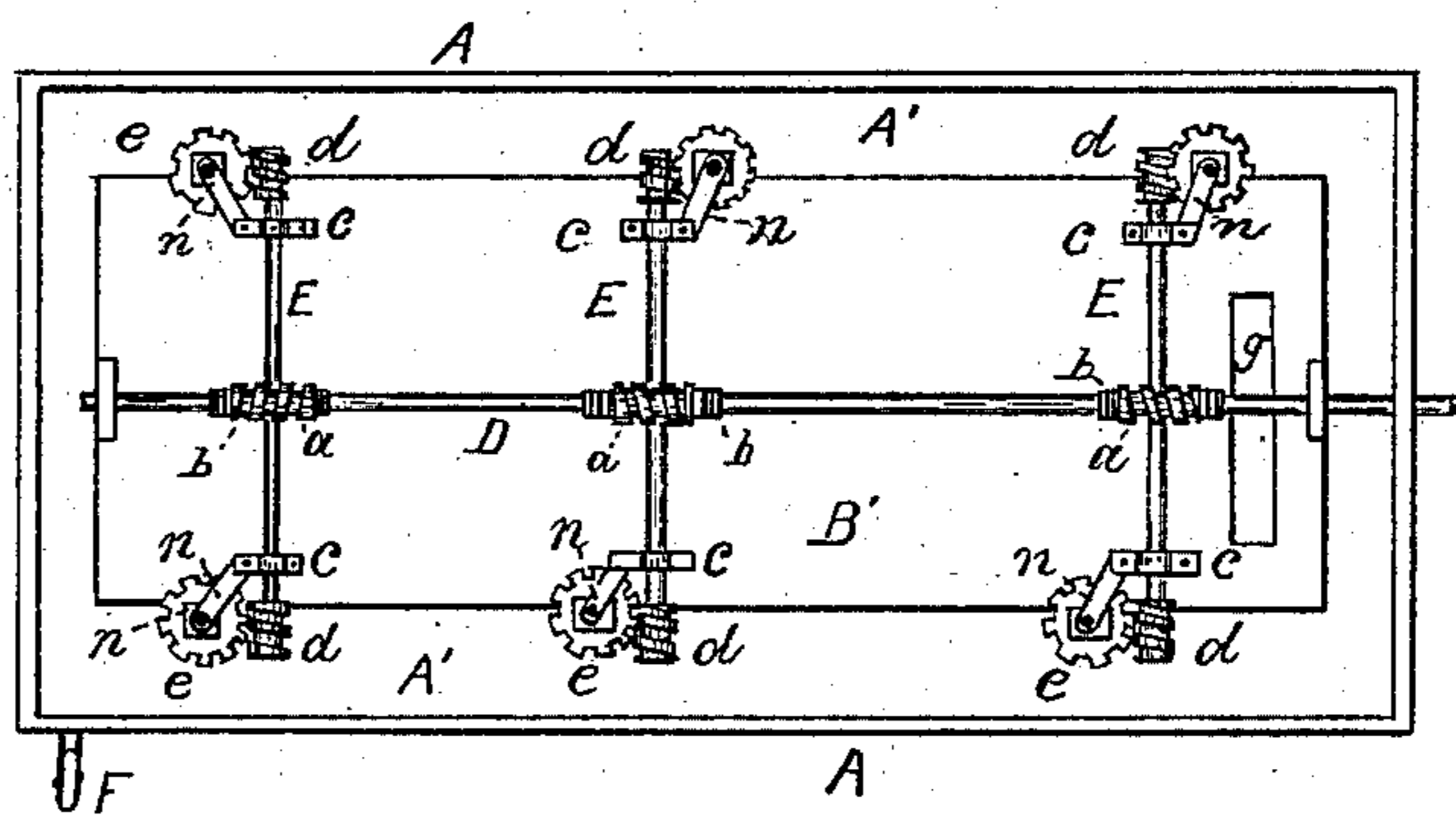


FIG. 3.



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(No Model.)

2 Sheets—Sheet 2.

D. GOODWILLIE.

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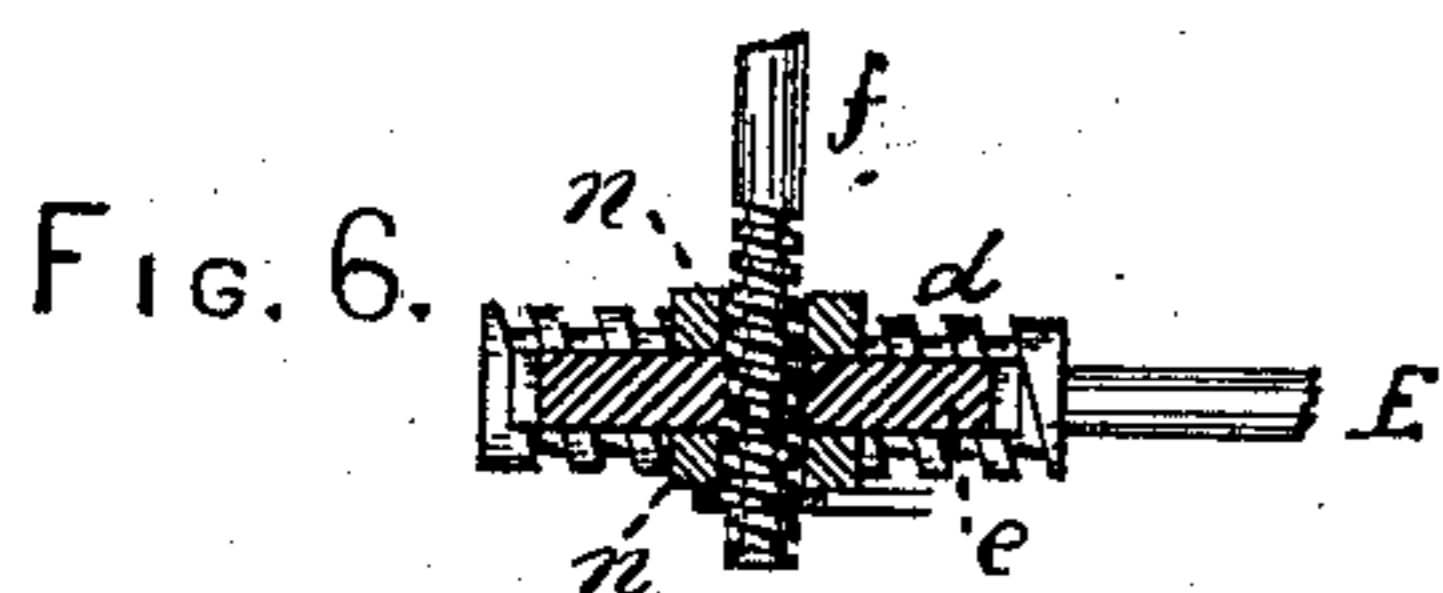
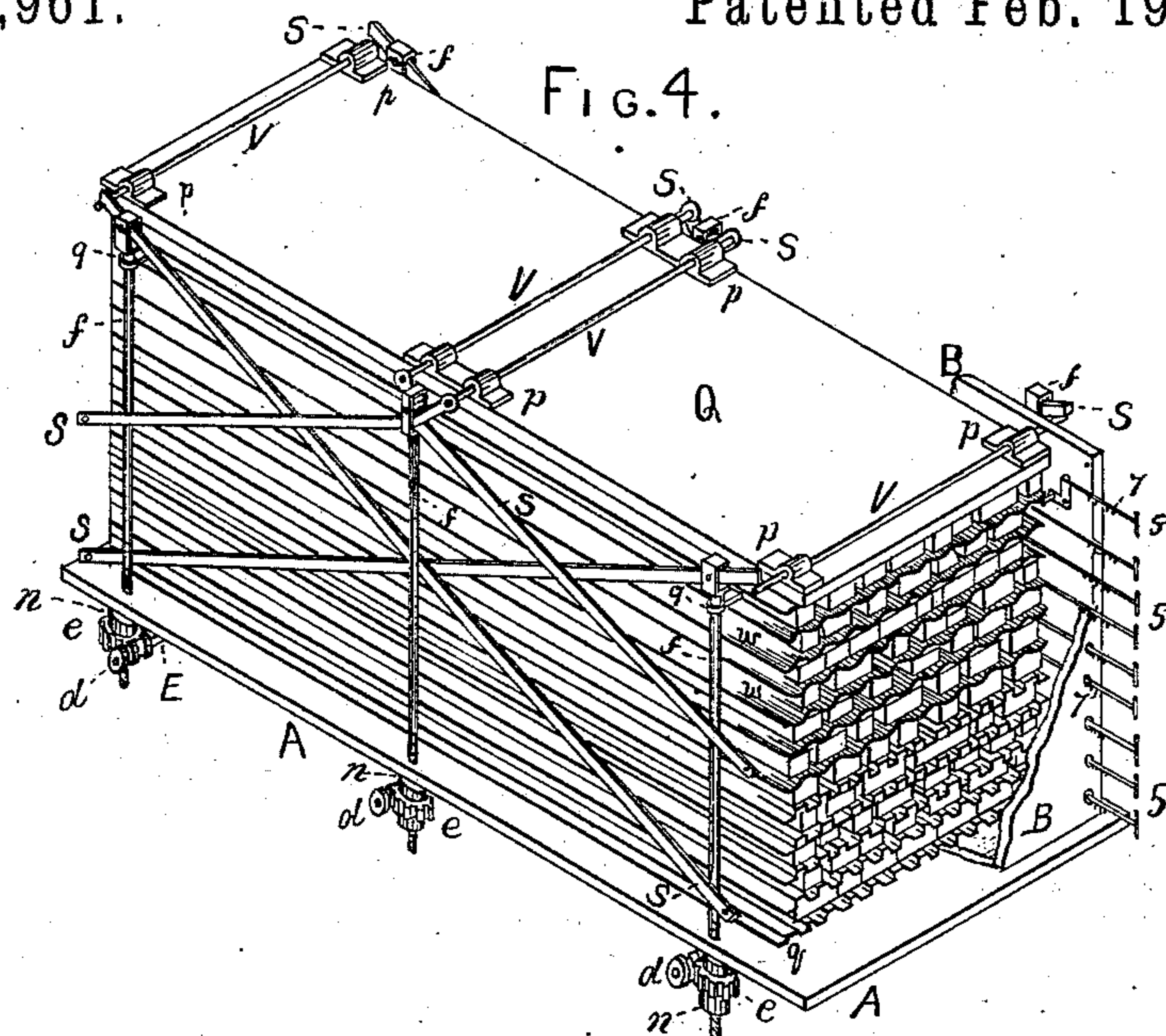


FIG. 5.

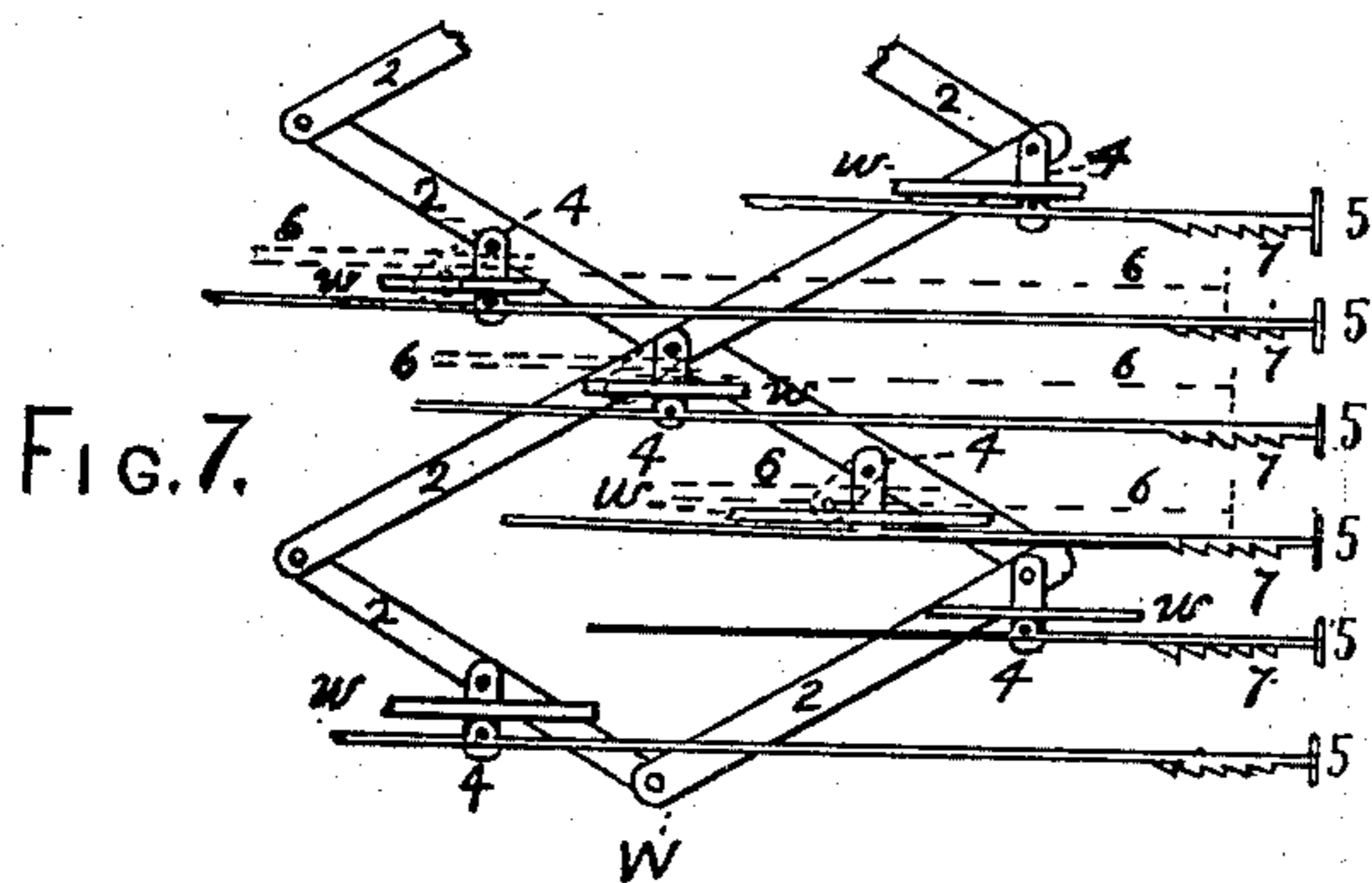
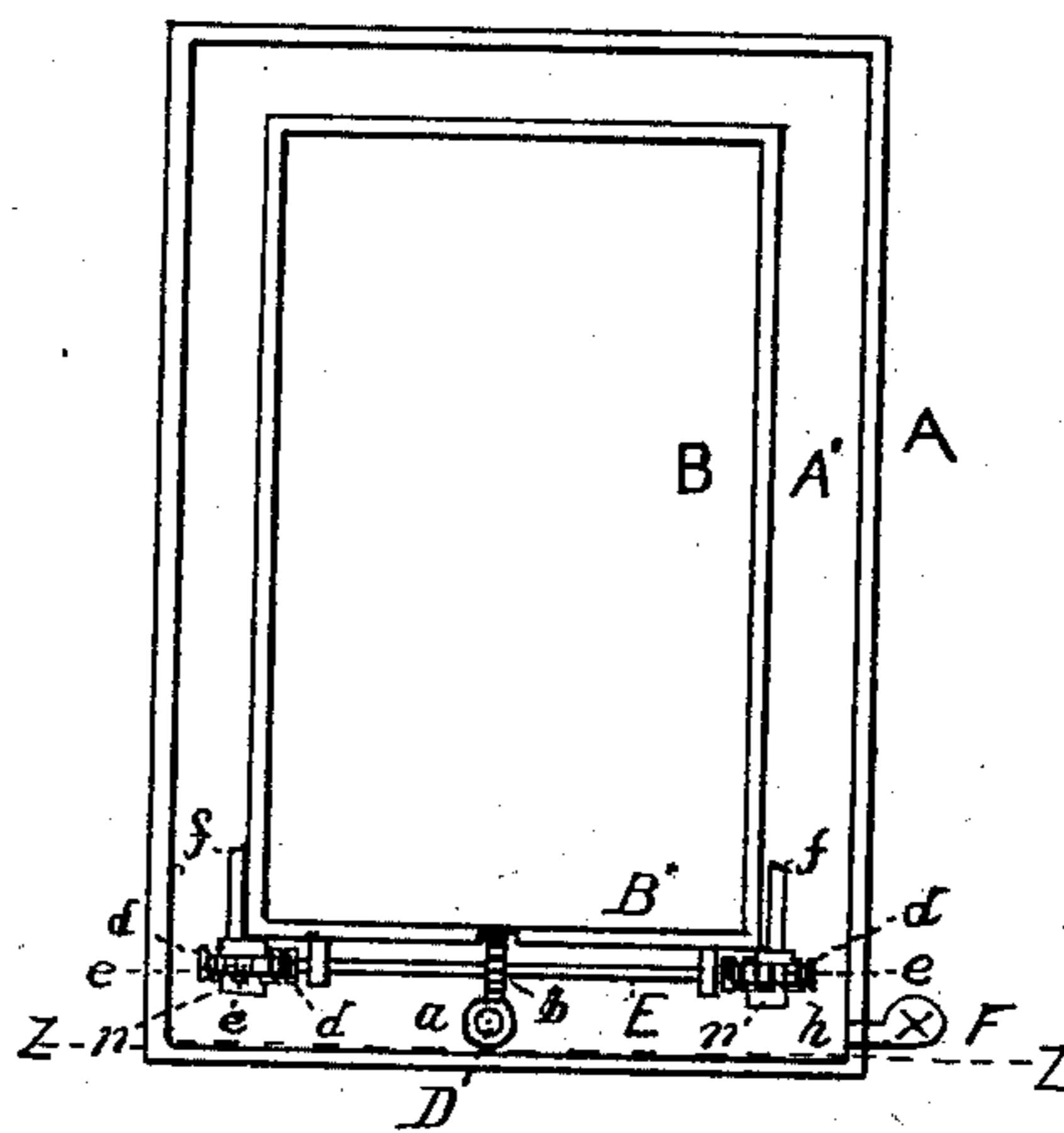
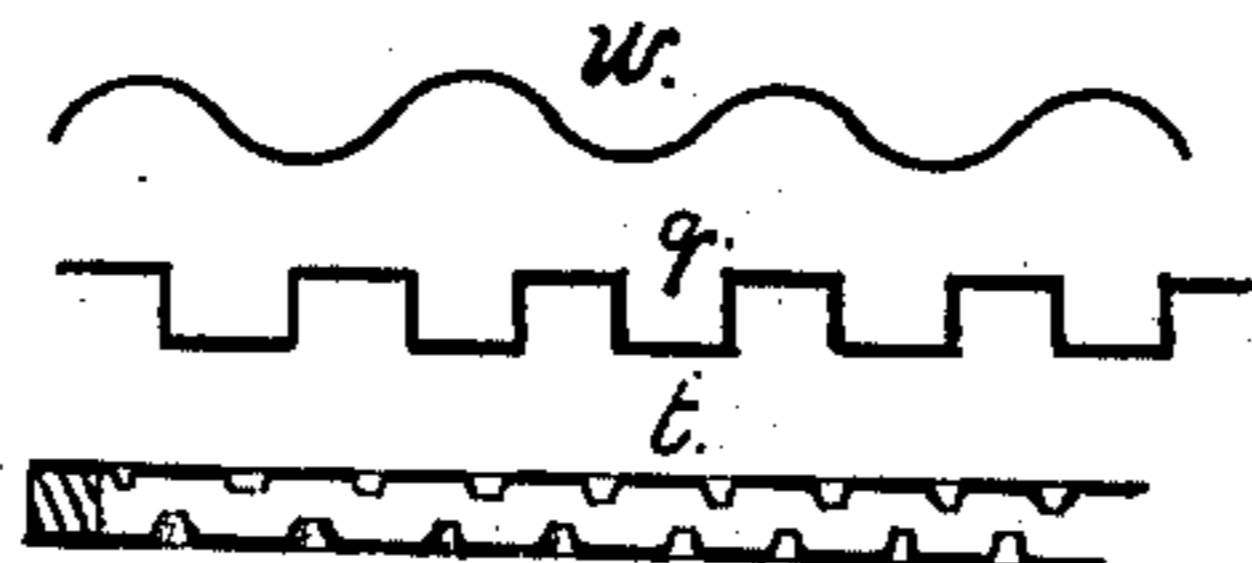


FIG. 8.



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# UNITED STATES PATENT OFFICE.

DAVID GOODWILLIE, OF OAK PARK, ILLINOIS.

## LUMBER-DRIER.

SPECIFICATION forming part of Letters Patent No. 293,961, dated February 19, 1884.

Application filed June 8, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID GOODWILLIE, of Oak Park, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Lumber-Driers, of which the following is a specification, reference being had to the accompanying drawings, illustrating the improvement, in which—

Figure 1, Sheet 1, is a longitudinal sectional elevation of a mechanism embodying my improvement; Fig. 2, Sheet 1, an end elevation of the kiln, and a vertical sectional elevation of the steaming and heating apparatus on line *x*, Fig. 1; Fig. 3, Sheet 1, a horizontal section on line *z*, Figs. 1 and 5, looking upward. Fig. 4, Sheet 2, is a perspective representation of the separating and pressing devices as applied to the lumber when being treated, the surrounding cases being mostly removed; Fig. 5, Sheet 2, a transverse sectional elevation on line *y y*, Fig. 1, with the mechanism, except the worm-gear, removed; Fig. 6, Sheet 2, an enlarged section of the gear for adjusting the lever-rods; Fig. 7, Sheet 2, an enlarged elevation of a portion of the device for adjusting the shelves supporting the lumber. Fig. 8, Sheet 2, represents three forms of lumber-shelves.

The present invention relates to perforated or corrugated plates placed between the courses of lumber for the better application of the drying forces, and subjecting the lumber to a continuous following pressure as it shrinks by drying. The object is to take lumber in any moist or uncured state and speedily dry it, and deliver it from the kiln free from warp, even should it be in that condition when placed therein, and also free from checks produced by the drying process. The form of mechanism I have found best adapted for this purpose and the least analogous to the art is as follows:

The single drying-chamber B is constructed only large enough to hold one length of lumber as it ordinarily comes from the mill, and I have found a chamber three and one-half feet wide and eight and one-half feet high serves well the purpose. This will hold the corrugated plates and about seventy-five courses of inch lumber; but the apparatus will operate successfully on a larger or smaller scale. The drying-chamber I prefer to make of iron-plate

suitably strengthened by bars and braces, in the ordinary manner of making strong boxes. The bottom B' should be strong enough to support the weight of the lumber and pressure, which may be about fifteen hundred pounds per square foot. Surrounding this drying-chamber B is an exterior case, A, which forms a surrounding chamber, A', to contain steam or hot air to keep the chamber B warm. The mechanism exterior to the chamber B is contained in this chamber A', except the operating-shaft, pulleys, and shelf-adjusting rods, as shown, to prevent the waste of heat, which would occur did all the mechanism protrude through the outer case, so that a uniform temperature in all weather may be attained by the least possible fuel.

The means for attaining the continuous pressure to keep the lumber flat consists, first, of a central longitudinal shaft, D, having suitable bearings in the ends of the cases forming the chambers, and being provided with worm-gear *a a a*, to drive the cog-gear *b b b* on cross-shafts E E E, which have bearings *c c c* in the under side of the chamber B.

On the ends of the shafts E are formed worm-gear *d*, which drive cog-gears *e*. These latter gears are what are known as "gear-nuts," and are held in position to raise or lower the rods *f* by means of bearings *n n* of suitable strength, secured to the bottom B' of the drying-chamber B. An opening, *g*, is formed in the bottom B', that steam and hot air may be alternately drawn out of chamber B and into the chamber A' and out at an opening, *h*, by suction-fan F. There is a large opening, G G, back of the furnace H, freely to admit hot air into the chamber B, from which it must pass down through the opening *g*.

Heretofore it has been the custom to let the hot air into the drying-room from below, and for it to escape upward through a flue, leaving the damp air at the bottom of the kiln; and fans have been used to accelerate a draft above the bottom of the drying-room floor; but I am not aware that heat has ever been admitted above the said floor at the same time a draft was attained through the drying-room by a suction placed below the floor, drawing the air into and out of an exterior

chamber, A', as shown in my kiln. The furnace shown at H has a steam-boiler and superheating-pipes J, and above the dome is a large hot-air chamber, L, which serves the purpose of at all times keeping a uniform supply of hot air to fill the chamber B. The pipes for conducting steam to the said chamber are shown at *m*, and the cock thereof at N. The bottom B' of the chamber B is supported by suitable bearings, P, on the bottom of the exterior case, A. A follower, Q, is made a part of the apparatus, and it is used in combination with the rods *f*, weighted levers *s*, bottom B', and gearing below to clamp the lumber together during the process of drying it. The levers, near their top ends, are pivoted to the top ends of the rods *f*, as shown, and at their outer ends are attached to wire ropes R, which run over pulley T and extend down and are weighted at U. Rods V V V are held to the follower Q by means of bearings P, and their ends extend out far enough to engage the ends of the levers *s*, so that the bringing up of the outer ends of the same by means of the weights U U U U will force the follower down. The chamber B, to save expense and inconvenience, is made not much too large for the lumber to be put therein. Therefore the levers *s* do not have sufficient sweep for following a pile of inch lumber of more than about twenty-five courses. Therefore when seventy or seventy-five courses of lumber are put in the drying-room, the rods *f* will have to be drawn several different times, far enough to readjust the levers in their present position, in order to keep a continuous pressure on the lumber, as I deem it better to put in the adjusting-gearing than to make the chamber B long enough for the levers to operate without readjustment. W W represent a double set of adjusting devices, which are placed on both sides of the lumber and inside of the chamber B, and are composed of a series of levers, 2, which are pivoted together at their ends and middle parts, and their ends are attached to the bottom B' and follower Q, and are extended or contracted with it. To these levers are pivoted, by means of straps 4, a series of corrugated shelves, *w*, at such distances apart as to suit different thicknesses of lumber. This is that the shelves may be elevated by ratchet-rods 5 7, to remove from or place lumber in the kiln. These ratchet-rods are pivoted to the straps 4, so that pushing in any one of them will raise the shelf supported by the particular straps 4 to which the rods are pivoted. The ratchets 7 will catch on the edges of the metal of chamber A', and hold the shelves *w* up far enough to relieve the lumber lying below the shelf which is raised. Pushing in all the rods 5 to any particular layer of lumber, it can be drawn out, or the whole lumber can be removed, leaving the corrugated shelves or plates remaining convenient for refilling the chamber, beginning on the shelf from which the last layer was removed; and

by reversing the position of the ratchet-rods 5 each layer will again rest on its respective corrugated shelf or plate.

It is proper to state that the shaft D must be rotated to raise the follower Q about one-half inch before either of the ratchet-rods can be pushed in and the shelves operated thereby elevated.

The direct means for raising the follower consist of collars 9 9 9 9, attached to the upper portion of the rods *f*, so as to project under the follower. Fig. 8 represents three forms of plates, *w q t*, to be used for shelves, as may be desirable, the ones shown at *w q* being the form employed at Fig. 4. These are shown full thickness for use—that is, about one-fourth of one inch—the one shown at *t* being formed of double plates of perforated metal. The purpose is to have numerous bearings between the courses of lumber, but to have each bearing have as little bearing-surface as possible, that the escape of moisture may not be impeded.

The operation is as follows: Lumber is to be put into the drying-chamber B, by means of doors in the two cases at the opposite end of the chambers A' B from the furnace H, of a size corresponding, substantially, to end area of the lumber-piling surface of the shelves *w*, the height of the doors being indicated by the space between the dotted lines 10 10, Fig. 1, and the width of the same by the distance between the dotted lines 11 11, Fig. 3. The doors being closed to make the chambers practically steam-tight at those places, steam superheated or live steam is let into the chamber G, and from thence, in the same state, is drawn into the chamber B, by the action of a suction-fan, F. The steam condensing is then drawn into the surrounding chamber A', and out at the pipe. After the lumber is thoroughly steamed, the steam is shut off, and hot air is admitted to the chamber B, and drawn off, together with the moisture taken from the lumber, in the same direction and by the same fan as was the condensing steam.

The steaming of lumber before drying is an old art; but the method and means employed, as herein set forth, I claim are new—that is, the means for letting the curing-gases into the drying-chamber above the point of the suction-draft, and in connection with the exterior chamber, A', whereby the process, in part, of drying depends on the keeping of the heavy gases out of the bottom of the drying-chamber, to admit those more expanded to come in contact with the lower portion of the lumber and carry off the moisture.

I claim as my invention—

1. In lumber-driers wherein the lumber is treated under a following pressure, the drying-chamber B, inclosed within the exterior case, A, to form an outer chamber, A', and having an opening, *g*, at the rear end of the bottom thereof communicating with the chamber A', beneath the bottom of chamber B, in combina-

tion with the furnace H, having the superheating steam-chamber L above, also with the suction-fan F, placed at the front of chamber A' and below the chamber B, for treating lumber with superheated steam and hot air, as specified.

2. In lumber-driers which hold the lumber under a following pressure, the mechanism to attain such pressure, consisting of the central horizontal shaft, D, provided with worm-gear *a a a*, the shafts E, provided with gear *b b b*, worm-gear *d d d*, the nut-gear *e* on the rods *f*, levers *s*, rods *v*, pulleys T, and weighted ropes R U, in combination with the chamber B and follower Q, the latter being elevated and depressed, as specified.

3. The combination of a series of shelves, *w*,

hung to adjusting devices W W, which are composed of levers 2, jointed, so that the entire length of the devices shall be shortened by the shrinkage of the lumber proportionately as one board will shrink, as specified.

4. The combination of the shelves *w*, hung to the levers 2 by pivoted straps 4, with the ratchet-rods 5 7, which are also pivoted to the straps, so that the shelves may be swung to the front and elevated, as and for the purpose specified.

DAVID GOODWILLIE.

Witnesses:

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