(No Model.)

5 Sheets—Sheet 1.

S. T. WELLMAN.

ROLLING MILL.

No. 277,860.

Patented May 15, 1883.

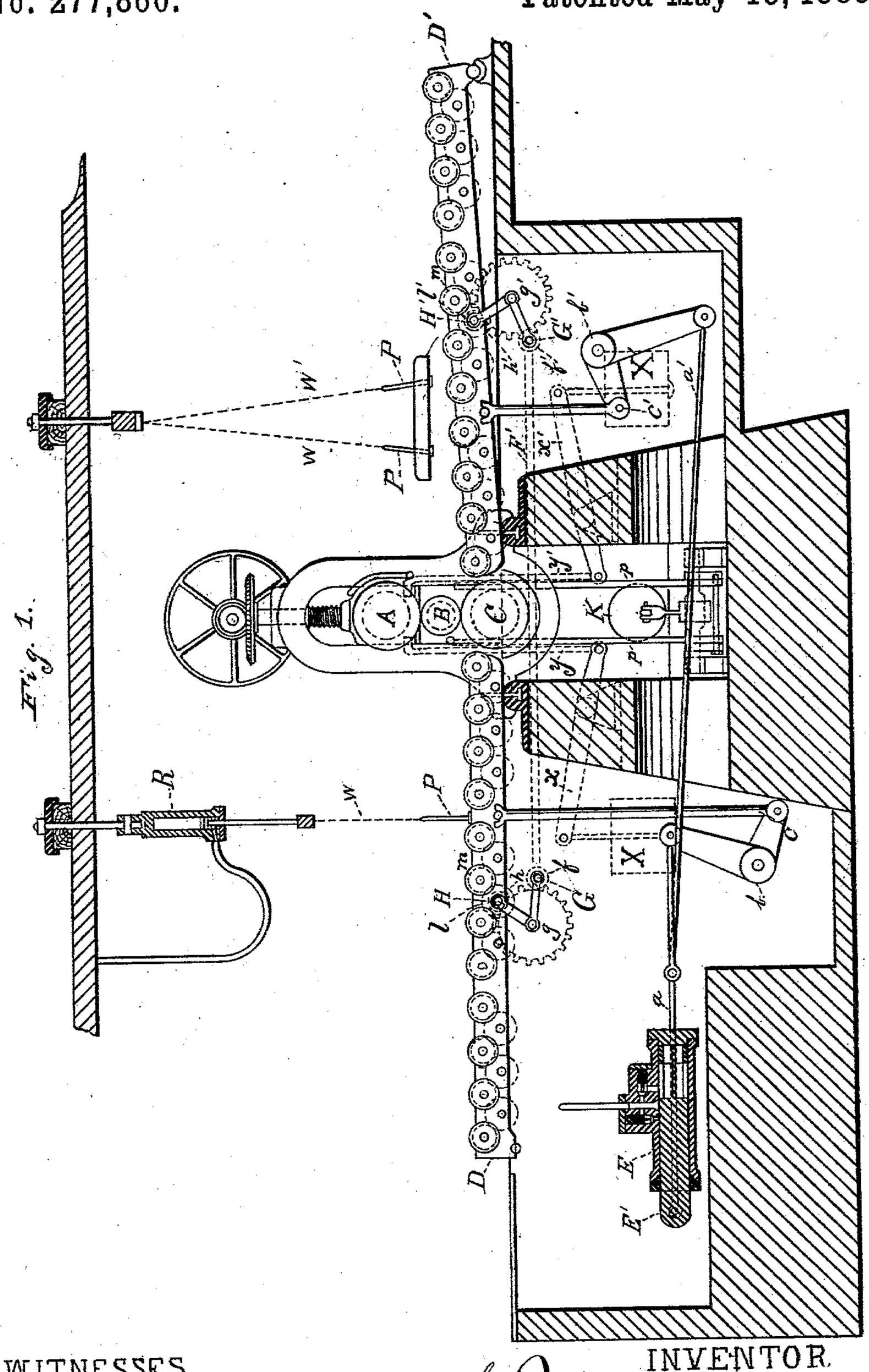

Fig. 1.

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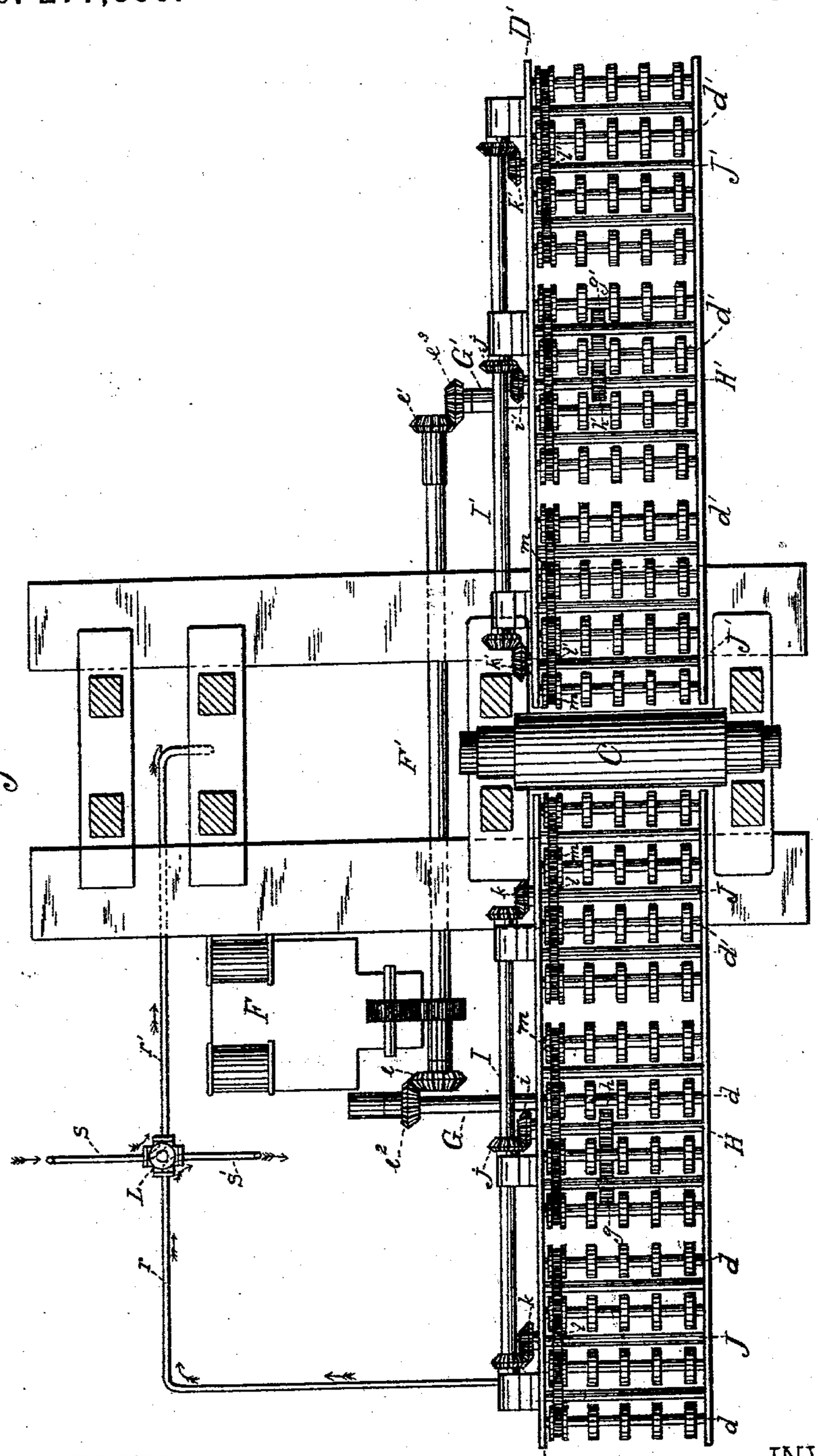

Fig. 2.

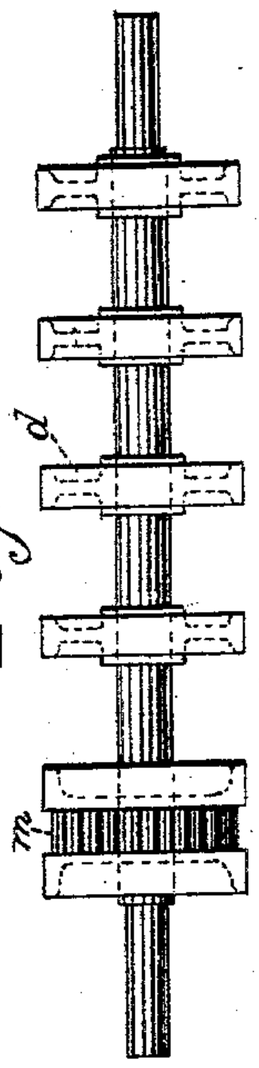

Fig. 3.

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Fig. 4.

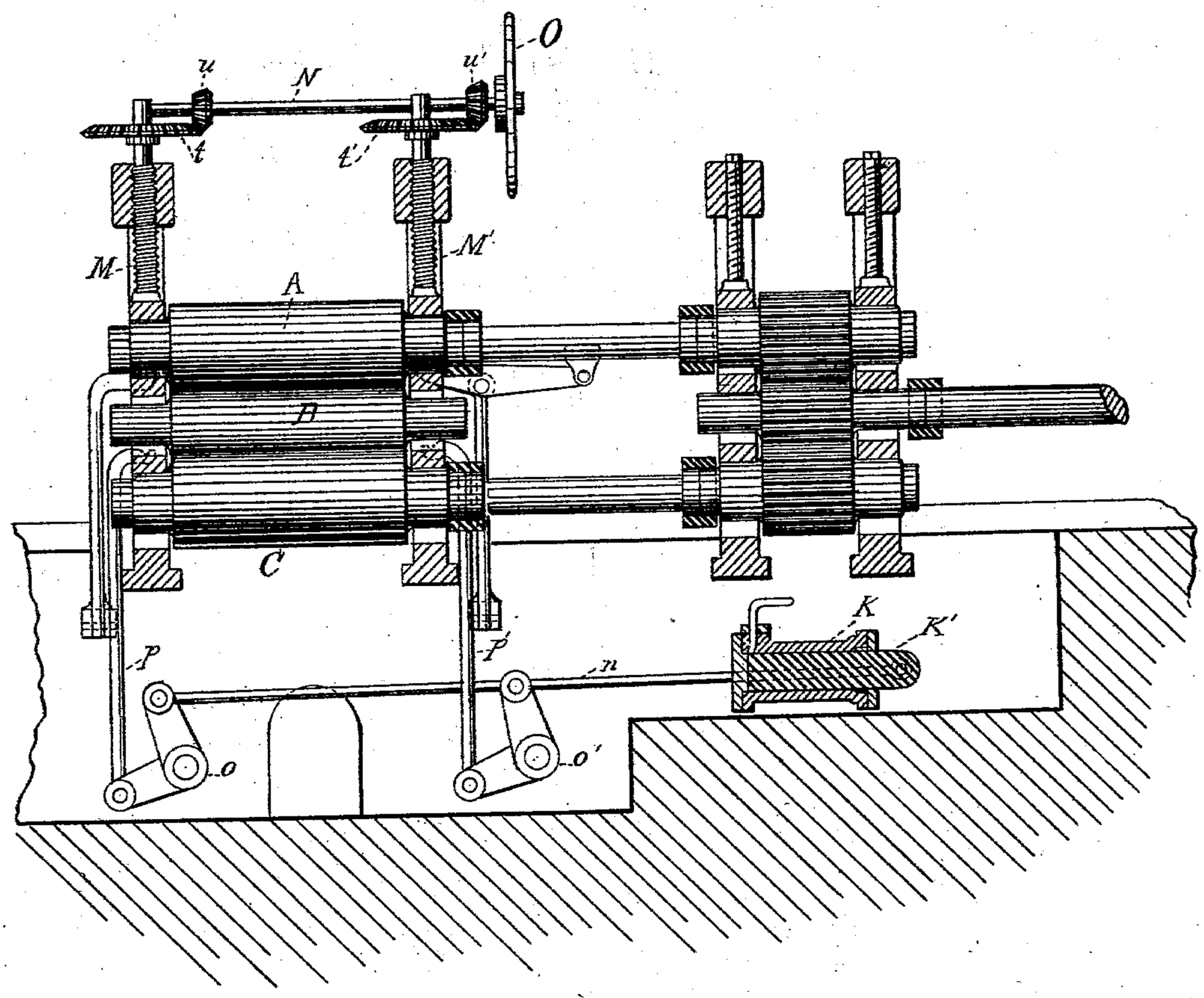


Fig. 5.

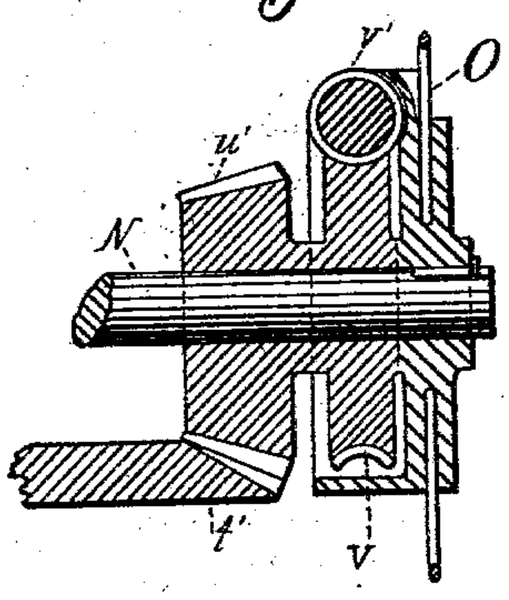
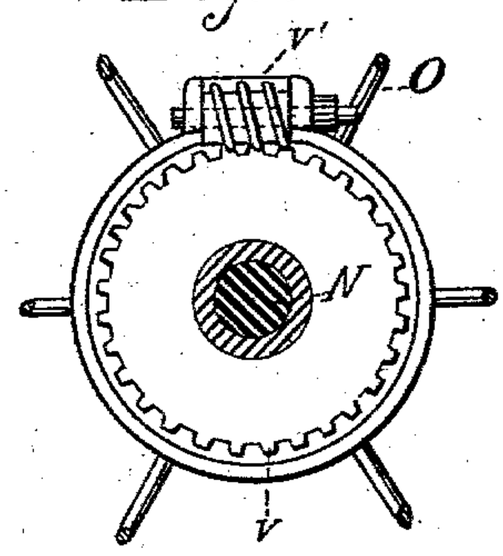


Fig. 6.



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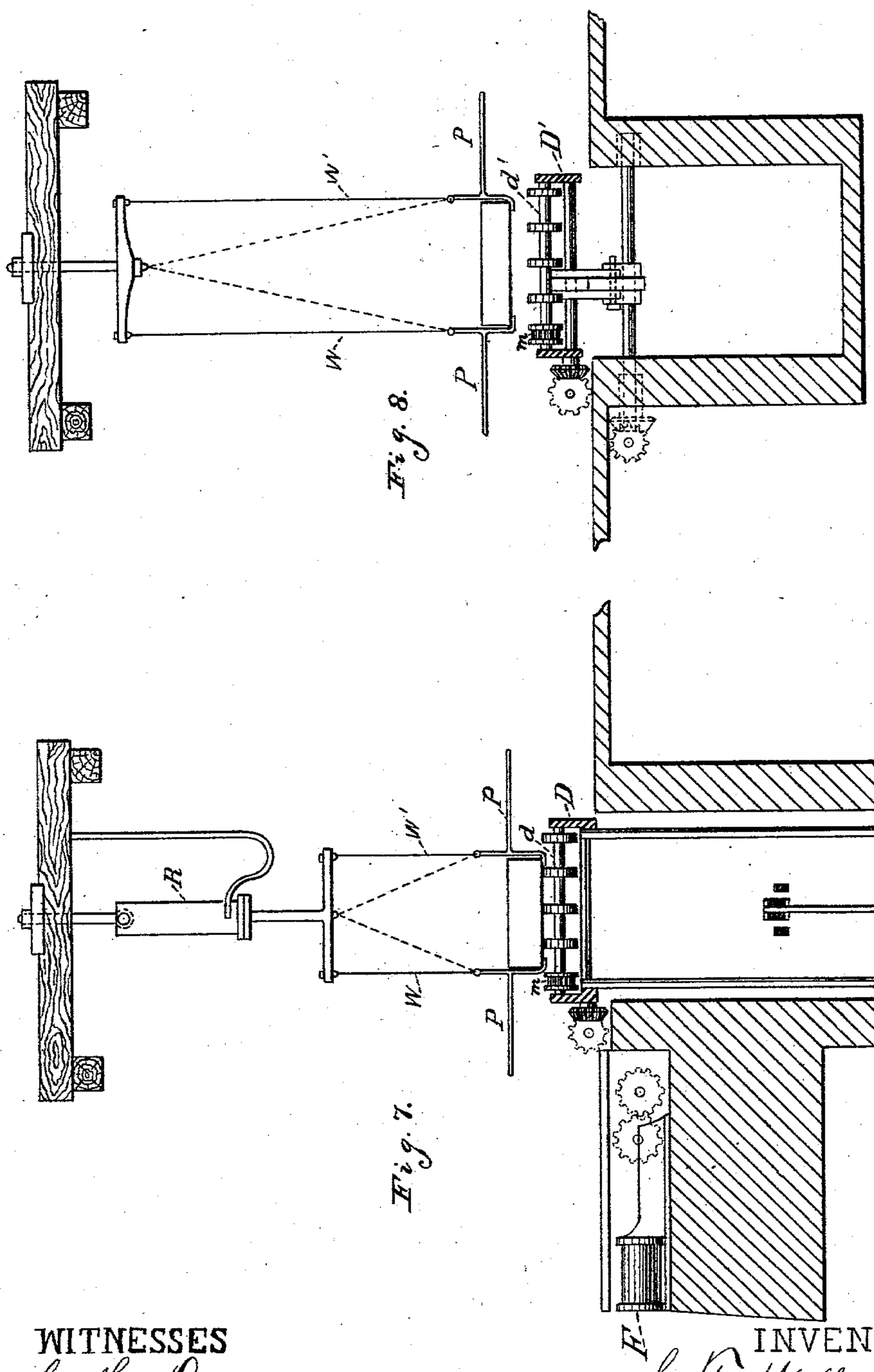

Fig. 8.

Fig. 7.

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Fig. 9.

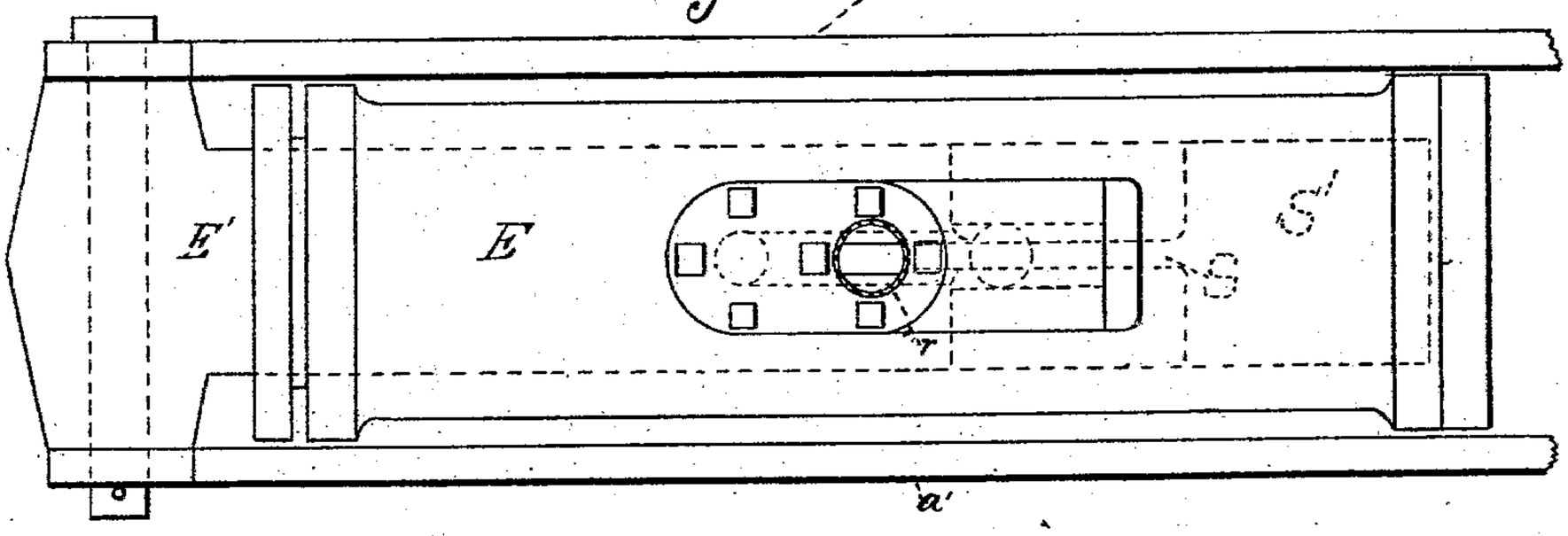


Fig. 10.

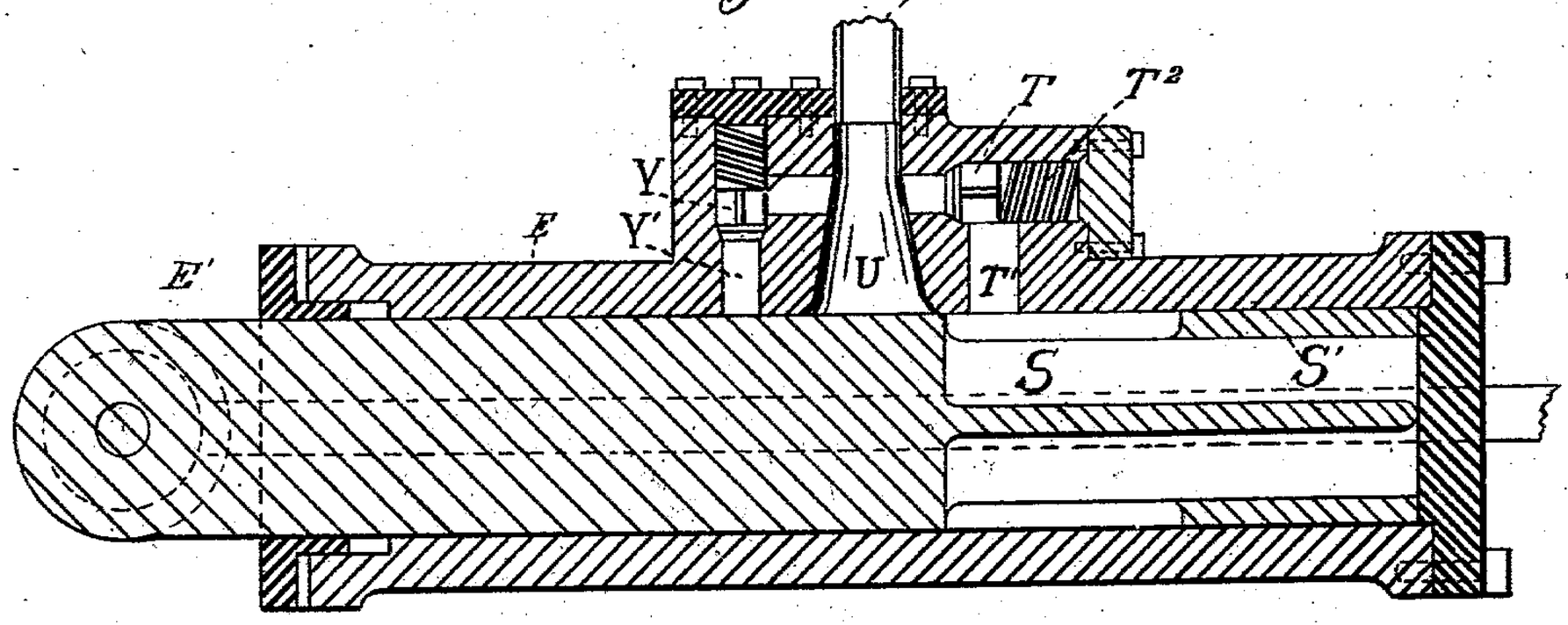
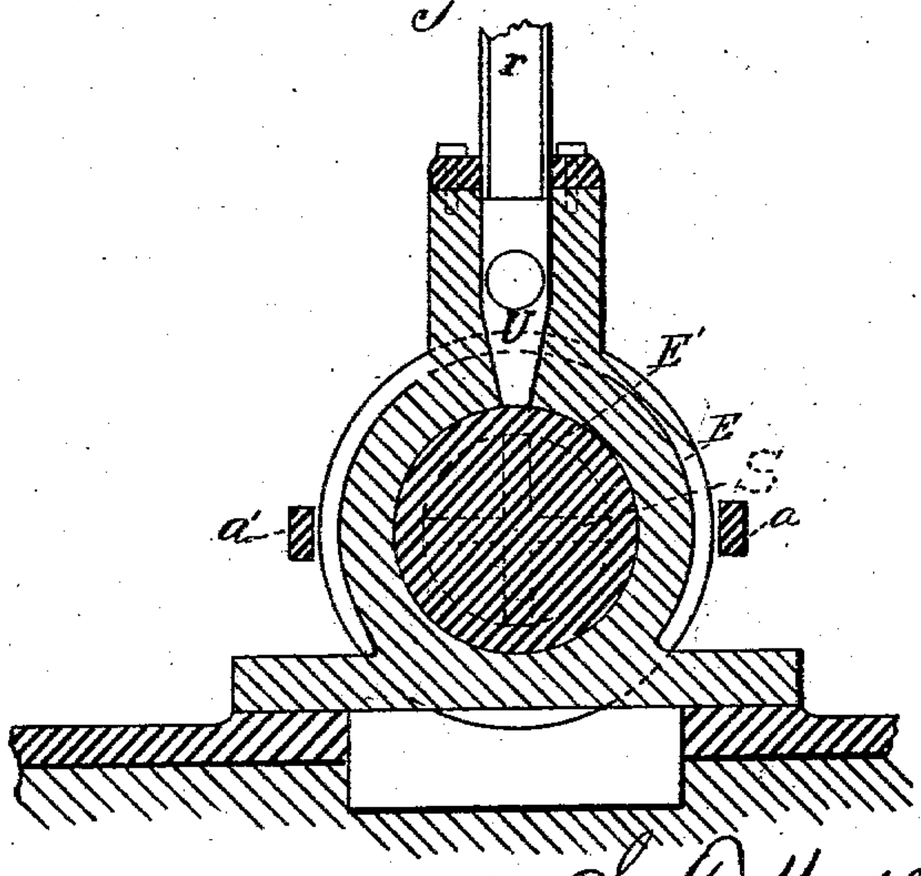


Fig. 11.



WITNESSES

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UNITED STATES PATENT OFFICE.

SAMUEL T. WELLMAN, OF CLEVELAND, OHIO.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 277,860, dated May 15, 1883.

Application filed May 29, 1882. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. WELLMAN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rolls for Rolling Metal; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to rolls for rolling metal and apparatus for handling the said metal while it is being operated upon; and it consists in the peculiar construction of said rolls and apparatus, as will be hereinafter fully set forth and claimed.

In the drawings, Figure 1 represents a longitudinal vertical section taken through my rolls and apparatus. Fig. 2 is a plan view, partly in section, of the same. Fig. 3 is an enlarged detached view, showing more clearly the construction of the table-rolls. Fig. 4 is a view in vertical section, taken through the roll-housing and driving mechanism, showing also my arrangement for raising and lowering the middle roll. Figs. 5 and 6 are enlarged views, in section, of my roll-adjusting device. Figs. 7 and 8 are views, in elevation, of devices for handling and turning the ingots or plates, and also showing a vertical cross-section taken through that part of my machine located beneath the said devices. Fig. 9 is a plan view of a cylinder and piston which I employ for operating to raise and lower the tables of my machine. Figs. 10 and 11 are sections taken through the same in different directions, showing the internal construction of the same.

A B C are a set of three-high rolls, or what are known as the "Lauth three-high rolls." D D′ are two tables, one on each side of the rolls. These tables are supported at their outer ends in such a manner as to allow their inner ends, or the ends next to the rolls, to be raised and lowered as is needed. The raising and lowering of the inner ends of the tables D D′ is accomplished by means of a cylinder, E, and piston E′, the construction of which is shown more clearly in Figs. 9, 10, and 11 of the drawings. To the projecting end of the piston is pivotally secured two rods, *a a′*. Said rods *a a′* are suitably connected to the crank-levers *b b*, which are in turn connected to the upright rods *c c′*. Upon the upper end of these rods *c c′* rest the inner free ends of the tables D D′. Thus it will be seen that as water or steam is fed to the cylinder E the piston E′ is forced outward, and pulls with it the rods *a a′*, which act through the crank-levers *b b′* to raise the rods *c c′*, and with them the free ends of the tables D D′. The object in raising and lowering the tables D D′ is to raise or lower the pile ingot or plate to the level of the space between the higher and middle rolls, or to the space between the lower and middle rolls, as the case may be. The tables D D′ are provided with a series of rollers, *d d′*, which are geared together in such a manner as to allow of the said rolls being driven or revolved whether the tables are raised or lowered. This is accomplished by means of suitable lines of shafting, with gearing which are preferably driven by means of a reversible engine, F; but they may be driven by any suitable driving-power. The manner of connecting these shaftings and gearing is as follows:

F′ is a shaft which receives the motion from the reversible driving-power. This shaft F′ is provided at both its ends with bevel-gears *e e′*, which mesh with bevel-gears e^2 e^3, secured to the ends of the shafts G G′. (See Fig. 1.) The shafts G G′ are also provided with pinions *f f′*, which mesh with the idlers *g g′*, said idlers in turn meshing with pinions *h h′*, secured on the shafts H H′. (See Figs. 1 and 2.) The ends of the shafts H H′ are provided with bevel-gears *i i′*, which mesh with bevel-gears *j j′* on the shafts I I′. (See Fig. 1.) The shafts I I′ are also provided with a suitable number of bevel-gears, which mesh with the gears *k k′* on the shafts J J′, said shafts J J′ being provided with pinions *l l′*, which mesh with gear-wheels *m*, secured on the roller-shafts.

By the use of the foregoing described train of gearing and shafting I am enabled to transmit motion in either direction to the rollers *d d′* at any time during the raising or lowering of the tables D D′, or after they have been raised or lowered. When the tables D D′ are lowered it is necessary that the middle roll, B, should be raised, so as to provide a space between it and the lower roll for the passage of the plate or pile; but when the tables D D′ are raised it is necessary that the middle roll, B,

should be lowered and a space provided between it and the upper roll for the passage back again of the plate between said middle and upper rolls. The raising and lowering of this middle roll is accomplished by means of a hydraulic or steam cylinder, K, and piston K′. The piston K′ is connected to a rod, *n*, which is in turn secured to one arm of the bell-crank levers *o o′*, the other arm of said bell-crank levers being secured to the rods *p p′*, to the upper ends of which are attached the bearings of the middle roll. Thus it will be seen that as the piston K′ is driven outward it will operate to raise the roll, and when it is allowed to resume its normal position it will lower the said middle roll, B.

The steam, water, or other forces which may be used to operate the pistons of the cylinders E and K are supplied to said cylinders through a four-way valve, L, which is shown in Fig. 2. This valve may be of any of the well-known forms which will act to supply the force to one cylinder and cut it off from the other cylinder, and allow what is in the cut-off cylinder to escape therefrom, as shown by arrows, Fig. 2, *r* being the pipe leading to the cylinder E, and *r′* being the pipe leading to the cylinder K. *s* is the supply-pipe from the container or generator, and *s′* is the waste-pipe through which the used steam, water, or other force passes from the cut-off cylinder. Thus it will be seen that when force is supplied to the cylinder E it is cut off and allowed to escape from the cylinder K, which will act to raise the tables D D′ and lower the middle roll, B, and vice versa.

My device for adjusting the bearings of the rolls A B C when they become worn more on one side than on the other is shown in Figs. 4, 5, and 6, and consists of two screws, M M′, which are journaled in the upper end of the frame or housing of the rolls, the lower ends of said screws resting on the journals of the upper roll, and their upper ends being provided with two bevel-gears, *t t′*.

N is a shaft which is provided with two bevel-gears, *u u′*, one of said gears, *u*, being keyed to the shaft N and the other, *u′*, being allowed to revolve around the said shaft. The gear *u′* is connected to or provided with a worm-gear, *v*, which is also loosely journaled on the shaft N. Hand-wheel O is keyed to the shaft, so as to rotate therewith. To the hand-wheel is secured a worm, *v′*, which meshes with the worm-gear *v*. By turning the hand-wheel O both screw-shafts M M′ are operated simultaneously. By turning the worm *v′* by means of a crank or other device the worm-gear *v* and bevel-gear *u′* are revolved on the shaft N and operate to rotate the bevel-gear *t* and screw-shaft M′, without operating the shaft M. By sliding the hand-wheel O outward, as shown in Fig. 4, and disengaging the worm *v′* from the worm-gear *v* the shaft N is rotated and the screw-shaft M is turned with the operating screw-shaft M′.

Figs. 1, 7, and 8 show my devices for handling and turning the plates, ingots, or piles. These devices consist of the levers P P, of which there may be any suitable number, on each side of the plate or pile. These levers are formed substantially in the manner shown in Figs. 7 and 8, and are suspended near their grasping or engaging end by suitable cords, rods, or chains, *w w′*. The upper ends of said cords, rods, or chains may be secured in such a manner as to support the weight of the plate or pile, and at the same time allow of its being turned around in a horizontal direction. One manner of securing the ends of the cords, rods, or chains, which is shown in Fig. 1 (to the right) and Fig. 8, will be readily understood. When it is desired to raise the plate or pile at the same time of turning it I secure the upper ends of the cords, rods, or chains to the piston of a vertical cylinder, R, which may be operated by any suitable force, and which is secured pivotally above the table of the machine, at the desired point. This manner of operating the handling and turning device is shown in Figs. 1 (to the left) and 7.

The construction and operation of my cylinder E are as follows:

E′ is the piston which is provided at its inner end with an X-shaped extension, S. (Shown in Figs. 10 and 11, dotted lines.) This X-shaped extension S is in turn provided at its inner end with a sleeve, S′, which surrounds the said extension at this end. The water or steam, as it passes to the cylinder E by way of the pipe *r*, first opens the valve T and enters through the port T′, which acts to slowly start the piston outward until its end has reached the port U, when the valve T will be closed by the spring T², as the water or steam is now permitted to pass through the large port U, which operates to drive the piston faster. When the piston E′ has reached nearly the end of its stroke the sleeve S′ gradually closes the port U, thus cutting off the supply of water or steam and gradually bringing the piston to a standstill. This construction of cylinder and piston prevents the jarring of the tables when they are being raised. When it is desired to reverse the motion of the piston E′ the valve Y first opens, which allows the water or steam to slowly escape from the cylinder through the port Y′ until the sleeve S′ has passed from under the port U, when the water or steam is allowed to escape freely until the piston has again closed this port U. After the port U has been closed the water still remaining in the end of the cylinder acts as a cushion for the piston, and thus the jarring of the tables D D′ is prevented when the said tables are lowered.

In order to counterbalance the upper roll and hold it up against the screws M M′, I provide weights X X′, suspended on the ends of pivoted levers *x x′*, the other ends of the levers *x x′* being pivotally secured to upright bars *y y′*, which are in turn attached at their upper ends to the under sides of the upper roll-journals.

The rollers *d d'* of the tables D D' are formed, as shown at Fig. 3, by shrinking a number of wheels of the same diameter on a shaft, said wheels being set a short distance apart. This construction enables me to make a lighter and cheaper roll, and rolls made in this manner are in every respect as operative as when formed solid.

I am aware that it is not broadly new to provide in a rolling-mill adjustable tables for supporting the metal to be rolled; nor is it new to provide an adjustable table with feed-rollers; nor is it new to provide vertically-adjustable tables with feed-rollers and friction-gearing for rotating said rollers in either direction; but I am not aware that heretofore feeding-rollers have been combined with adjustable tables and mechanism for revolving said rollers in either direction during the operation of adjusting said tables.

I am further aware that the broad combination of an adjustable table for supporting the metal to be rolled with an adjustable roll is not new; but, so far as I am aware, I am the first to combine with two pivotal and adjustable tables an adjustable roll, and means for conjointly and simultaneously adjusting said tables and roll.

What I claim is—

1. In a metal-plate-rolling machine, the combination, with three-high rolls, the middle roll adapted to be raised and lowered, of two tables, one on each side of the rolls, said tables being pivotally supported at their outer ends, and mechanism, substantially as described, for simultaneously raising the inner and adjacent ends of the tables and lowering the middle roll, and for lowering the inner ends of the tables and raising the middle roll, substantially as set forth.

2. In a metal-plate-rolling machine, the combiuation, with three-high rolls, the middle roll adapted to be raised and lowered, of a table for supporting the plate or ingot, said table being pivotally supported at its outer end, power-cylinders and pistons, rock-shafts and connecting mechanism, substantially as described, and a valve for admitting and exhausting liquid or steam from the cylinders, whereby the table is raised and the middle roll lowered, and the latter raised and the table lowered, substantially as set forth.

3. In a metal-plate-rolling machine, the combination, with three-high rolls, the middle roll adapted to be raised and lowered, of two tables pivotally supported at their outer ends, power-cylinders, pistons, connecting mechanism, and valve for simultaneously raising the tables and lowering the middle roll, and lowering the tables and raising the middle roll, and mechanism, substantially as described, for driving the feed-rollers in either direction in any different adjustment of the tables, substantially as set forth.

4. In a machine for rolling metal plates, the combination, with the table or tables for supporting the plate, pile, or ingot, of the swiveled cords, rods, or chains, said cords, rods, or chains having secured to their lower ends suitable grasping devices provided with levers, substantially as set forth.

5. In a machine for rolling metal plates, the combination, with the swiveled cords, rods, or chains, provided at their lower ends with devices adapted to engage with the plate, pile, or ingot, of a pivoted cylinder and piston for raising the said plate, pile, or ingot, and holding it when suspended, substantially as and for the purpose shown and described.

6. In a machine for rolling metal, the combination, with the screw M', provided at its upper ends with a gear-wheel, of the gear-wheel *u'*, provided with a worm-gear, and the worm *v'*, secured to the hand-wheel, substantially as and for the purpose shown and described.

7. In a machine for rolling metal, the combination, with rolls and an adjusting-screw provided with a gear-wheel, of a shaft having a gear-wheel loosely mounted thereon and arranged to mesh with the gear-wheel on the adjusting-screw, a hand-wheel locked to said shaft, and means for securing the hand-wheel and gear-wheel together in any desired rotary adjustment, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL T. WELLMAN.

Witnesses:
JNO. CROWELL, Jr.,
CHAS. A. FRYE.