

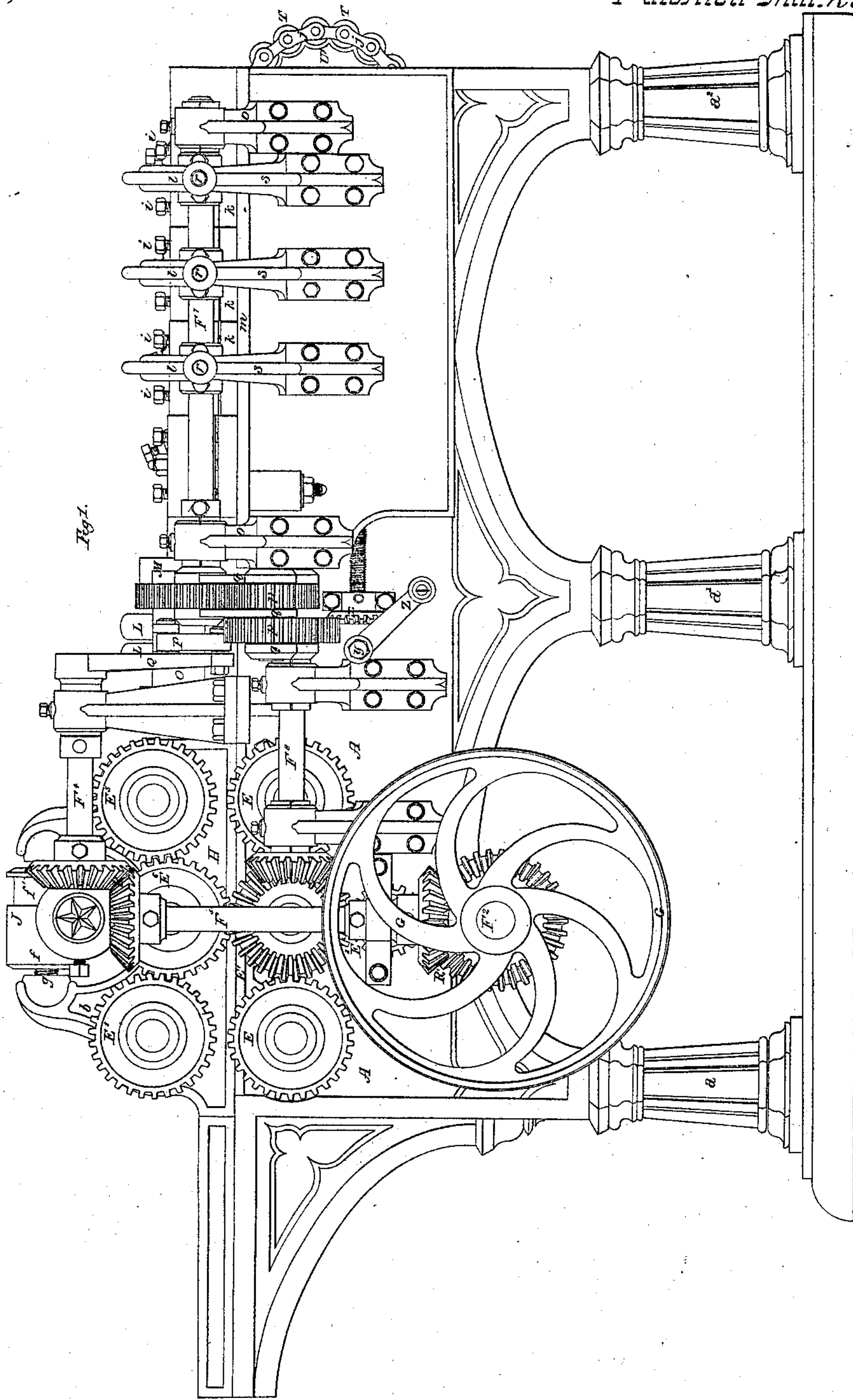
J. Howarth,

Sheet 1-4 Sheets

Wood Planing Machine,

No 8,823,

Patented Mar. 23, 1852.



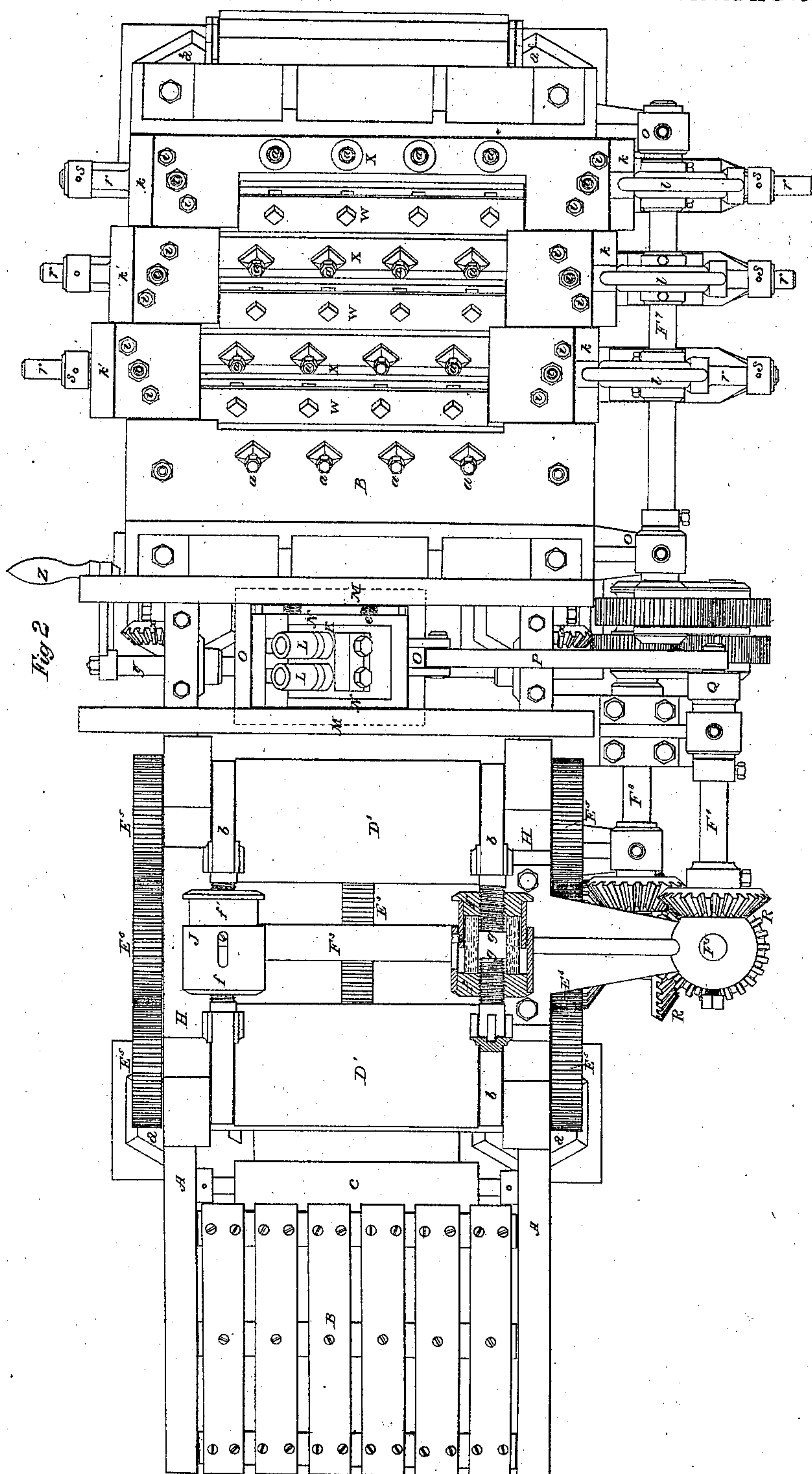
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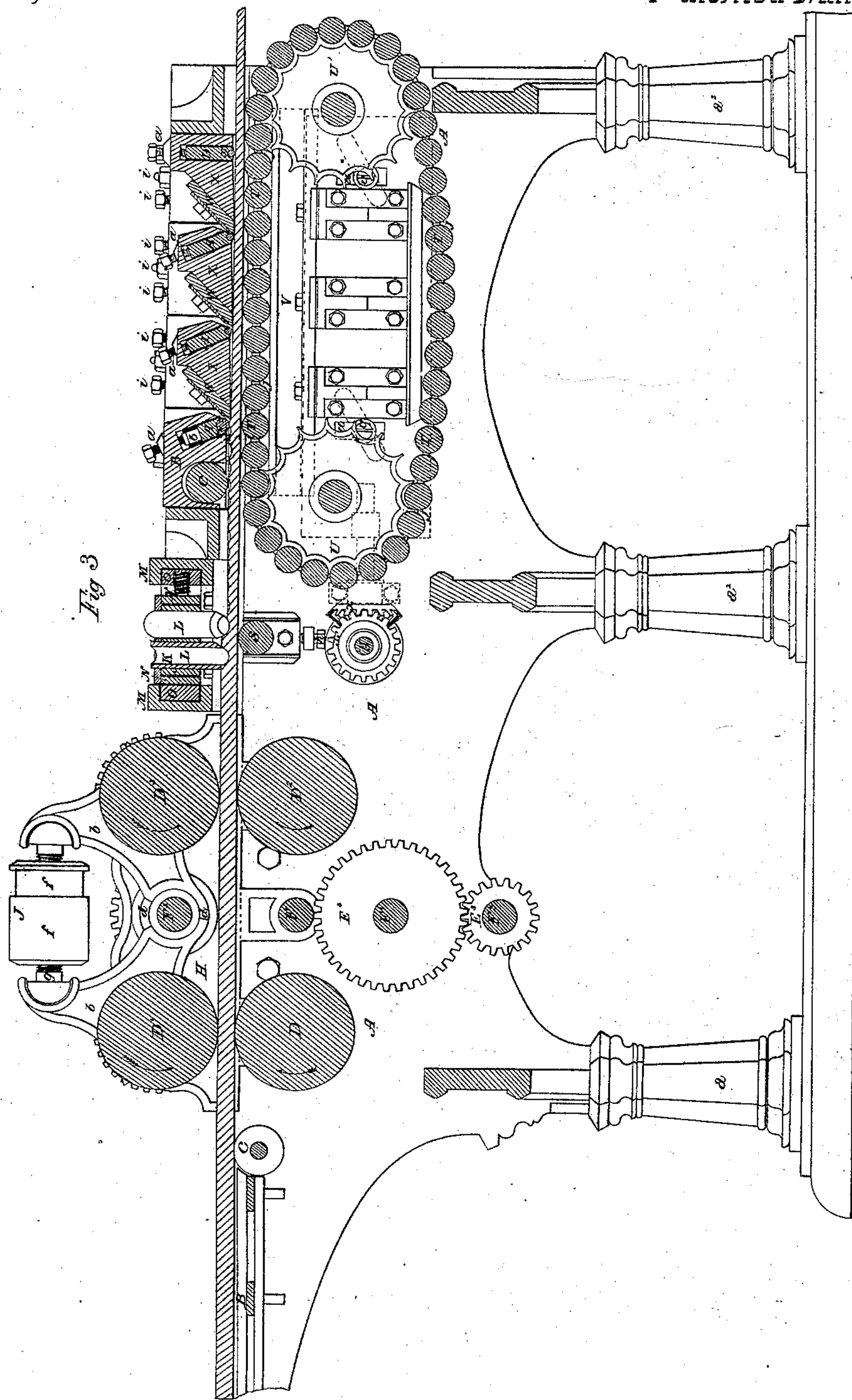


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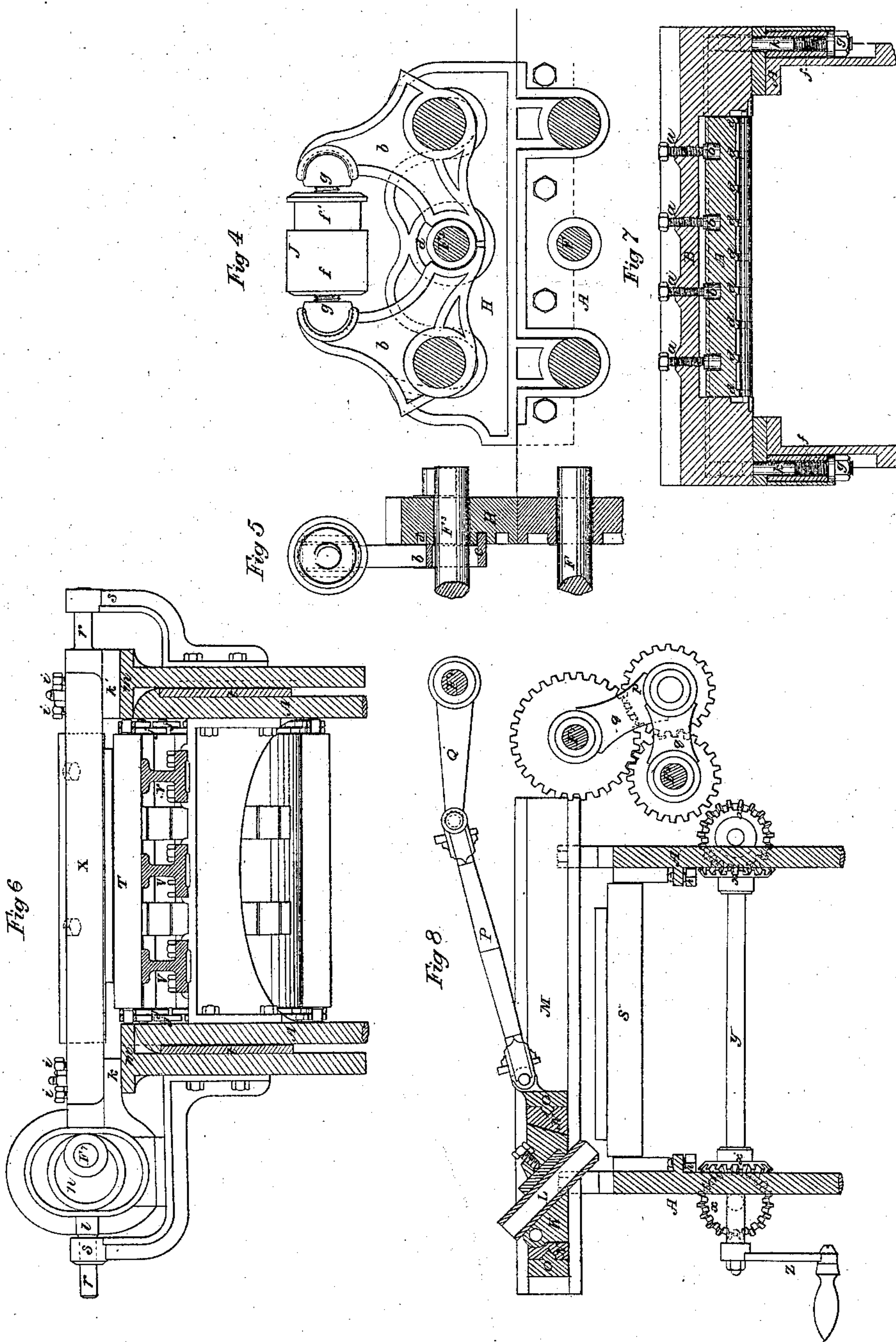


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UNITED STATES PATENT OFFICE.

JOHN HOWARTH, OF SALEM, MASSACHUSETTS.

PLANING-MACHINE.

Specification of Letters Patent No. 8,823, dated March 23, 1852.

To all whom it may concern:

Be it known that I, JOHN HOWARTH, of Salem, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Planing Lumber, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1 represents a side elevation of my planing machine, Fig. 2 is a plan of the same; Fig. 3 is a vertical longitudinal section through the center of the same; Figs. 4 and 5 are detached views of portions of the feed apparatus, and Figs. 6, 7, and 8 are cross sections of the machine at different points.

My invention is divided into several parts, some of which may be applied independently of the others to machines already constructed. The first of these consists of an apparatus for reducing the thickness of the lumber and for scoring it transversely.

The next part of my invention consists in an unyielding roller mouth piece which is constructed in such manner that it may be made sufficiently small to break the shavings efficiently, and is nevertheless so rigid that it cannot bend or yield to the pressure.

The next part of my invention consists in imparting a reciprocating movement to the plane irons in directions transverse to that in which the lumber is moved, whereby the work is performed with a less expenditure of power and greater perfection.

The structure and operation of these several parts of my invention will be more fully understood by reference to the accompanying drawings which represent a planing machine in which the principles of my invention are embodied, and in which—

A is the frame of the machine which is of rectangular form, is supported at a convenient height above the ground by legs, a , a' , a^2 , and in this example is formed of cast iron. The side pieces of this frame project in front of the first pair of legs, a , and support an apron B upon which the board or other piece of lumber to be planed is entered. At the hinder extremity of this apron is a friction roller C which extends across the frame and facilitates the movement of the board to the feed apparatus.

The feed apparatus is situated behind the apron and is secured to that part of the

frame which extends between the first and second pair of legs a a and a' a' . It consists of two pairs of rollers D, D', and D², D³, which extend across the frame. The lower roller of each pair is stationary, its journals being supported in suitable boxes secured to the side pieces of the main frame. The journals of these rollers project beyond their boxes and are fitted with cog wheels E E whose teeth engage with those of similar wheels E', E', which are secured to an intermediate shaft F. The wheels E', E', of this latter shaft gear into a pair of pinions E², secured to a counter shaft F', beneath, which is fitted with a cog wheel E³, whose teeth engage with those of a pinion E⁴, on a driving shaft F². The latter is fitted with a belt pulley G, to which the power of the prime mover is transmitted by means of a belt. The upper two rollers D' and D³, are situated immediately above the stationary ones D and D², in front and behind a second intermediate shaft F³, whose journals are supported in boxes secured to broad standards H, H, erected upon the side plates of the main frame. The journals of the upper feed rolls are passed through boxes which are secured in radius plates b b . The latter are constructed with annular flanges c at their adjacent extremities, which are fitted into annular grooves d formed in the standards H concentric with the second intermediate shaft F³, so that the upper rollers can move from and toward the lower stationary rollers in arcs of circles without changing their distances from the secondary intermediate shaft F³. The lateral strain upon the radius plate is prevented by prolonging the journals of the upper rollers and passing them through the curved slots formed in the standards H, H. These upper rollers are caused to revolve simultaneously with the lower ones, by means of cog wheels E⁵, E⁵, which are secured to the extremities of their journals, and which gear into cog wheels E⁶, E⁶, secured to the second intermediate shaft F³. These latter cog wheels also gear into those of the lower intermediate shaft F, so that when the latter is put in motion by the driving power the four feed rollers are caused to revolve simultaneously in the directions severally indicated by the arrows in the drawing. In order that the lumber may be gripped by the feed rollers with sufficient force to propel it through the planing apparatus, the

upper rollers are pressed down upon the lower ones by means of springs. These springs are in this instance formed of india rubber and are contained in cylindrical cases J, J, which are inserted between the upper extremities of the radius plates *b*, *b*. Each case is formed of two parts *f* and *f'*, one of which is constructed to slide over the other, and each is fitted with a screw-stem *g* by means of which the pressure of the spring may be varied.

The scoring apparatus is situated behind the feed apparatus and consists mainly of a plane which is moved to and fro transversely from one side of the machine to the other, and of a roller by means of which the lumber is firmly supported. The scoring plane in this instance consists of a plane stock, K, to which two tubular or gouge plane irons, L L, are secured at a proper angle to act upon the lumber. This plane stock is hinged at its hinder extremity to a frame N, which is constructed to slide in the direction in which the board is moved within an outer frame O, and is pressed toward the feed apparatus by springs *e*, *e*. The outer frame, O, of the scoring plane is constructed to slide transversely over the main frame upon a secondary frame or carriage M, and it is connected by a rod P with a crank Q secured to a shaft F⁴, which is supported in suitable boxes at the side of the machine. This crank shaft is caused to revolve by the driving shaft F², the motion being imparted to it through the intervention of an upright shaft F⁵, and two pairs of beveled wheels R and R¹. Beneath the carriage M is the roller S by means of which the board is supported while the scoring irons are acting upon it. This roller extends from one side of the machine to the other, and its journals are supported in suitable boxes which are constructed to slide vertically in slots formed in the side pieces of the main frame and are adjustable by screws *h* to set the roller at the proper height.

The apparatus for planing or dressing the surface of lumber is situated behind the scoring apparatus, and consists mainly of a series of plane irons acting in succession upon the wood, of a moving bed for supporting the boards, and of a series of mouth-pieces for breaking the shavings and preventing the splitting of the wood in advance of the cutting edge of the planes.

The bed by means of which the boards are supported consists of an endless chain of friction rollers T, T, whose journals are connected by links *j*, *j*. This chain of rollers is applied to two barrels or drums, U and U', whose journals are supported in boxes secured to the side plates of the machine. The upper portion of the chain which extends between these drums is supported by a

series of rails V which extend lengthwise with the machine and prevent the sagging of the chain.

The planes are constructed to move transversely in order to produce a drawing cut. Each consists of a plane iron W and plane stock X. The former is firmly secured to the latter at a proper planing angle, and the latter is secured at its extremities to shoes, *k* and *k'*, by screw bolts. It is also fitted with set screws *i* *i* by means of which its position upon the shoes can be adjusted to vary the set of the plane iron and the thickness of the shaving cut by it. The shoes of all the planes in the series are constructed to slide at right angles with the direction in which the board is propelled by the feed apparatus, upon the side pieces *m*, *m*, of an adjustable carriage which can be raised or lowered to set the lower edges of the plane irons at a greater or less distance from the movable bed beneath. In order to impart the proper movement to the planes their shoes at one side of the machine have ring frames *l* formed upon them which embrace eccentric sheaves *n* secured to a shaft F⁷. This eccentric shaft is supported by brackets *o* secured to the side of the plane carriage, and a suitable rotary motion is imparted to it from the intermediate shaft F, through the intervention of a shaft F⁸ and cog gear. The shaft of the intermediate cog wheels, *p* and *p'*, which connect the two shafts F⁷ and F⁸, is connected to these two shafts by link bars, *q* *q*, the whole arrangement being such that the eccentric shaft can rise and fall with the plane carriage without drawing the teeth of the cog wheels out of gear. In order to guide the plane stocks in their movement their shoes are fitted with stems *r* *r* which are passed through guide standards *s* *s* secured to the opposite side plates of the plane carriage.

The plane carriage consists of two side pieces *m* *m* connected by cross ties. It is raised and depressed by means of two slide plates *t*, *t*, which have inclined slots formed in them through which pins *v* *v* are passed. The pins also pass through vertical slots *u*, *u*, which are formed in the side plates of the main frame and which guide the plane carriage in its movement. The side plates *t*, *t*, are moved longitudinally to effect the movement of the plane carriage by means of screws *w* whose heads are fitted with beveled wheels *x*, *x*, which gear into similar wheels *x'*, *x'*, secured to a transverse shaft *y*. This shaft is fitted with a crank Z by means of which it is turned to move the side plates, and consequently to raise or depress the plane carriage and its planes.

Each plane iron is preceded by a mouth-piece. That A of the first plane iron in the series is secured to a stock B which is made fast to the plane carriage. Those A' of the

remaining plane irons are secured to the hinder parts of the plane stocks immediately preceding them. Each consists of a small roller which extends across the machine and of the roller stock to which the roller is secured. The roller stock is constructed to slide in a socket formed in the hinder part of the plane stock to which the mouth-piece is secured. The direction of this socket is such that the plane passing through its center bisects the angle formed by the surface of the board and the face of the plane iron; hence the mouth piece in rising and falling will always press at the same angle upon the shaving whether the latter be thick or thin, and will always maintain the roller in the same relative position with respect to the faces of the board and plane iron. The journals of the roller are secured in boxes made fast to the roller stock, and the position of the roller is regulated by set screws *a* which act upon the upper edge of the roller stock. As the surface of the board after the scoring planes have acted upon it is wavy and irregular it is advisable that the mouth piece of the first plane iron should accommodate itself to these irregularities. This may be effected by inserting springs of india rubber *b* in sockets formed in the roller stock immediately beneath the set screws *a a*. The roller must necessarily be of small diameter in order that it may break the shaving efficiently, and in order that its barrel may not spring under the pressure it is supported at suitable intervals by rests *d* projected from the roller stock. The mouth piece of the first plane is preceded by a yielding roller *C* whose journals are supported in boxes secured to the plane carriage. The stems *h* of these boxes are passed through sockets in which springs *f* are inserted whose tension can be regulated by screw nuts *g*. The last plane in the series is succeeded by a small roller *z*. This roller is secured to a roller stock *D* which is similar to those of the mouth pieces and is arranged in a vertical socket formed in the last plane stock.

The operation of this machine is as follows: Power is imparted to the driving shaft *F*² by means of a belt and pulleys, or by some other suitable mechanical device, and is transmitted through the various wheels and shafts to the several acting members of the machine. By this means the feed rollers are caused to revolve in the directions indicated by the arrows in the drawing, the reducing and scoring planes are caused to traverse rapidly across the machine, and the finishing planes to move slowly in directions parallel with their edges under the action of their respective eccentrics. The adjustable carriage upon which the finishing planes are secured is then set, by turning the shaft *y*, in a proper position to place the edges of the last plane iron in the series at a distance

from the surface of the endless bed equal to the thickness of the finished board. The boards to be planed are introduced endwise and one at a time upon the apron at the front end of the machine, and, being passed over the friction roller, are shoved between the first pair of feed rollers. As the board meets these rollers the upper one rises and permits it to enter between them. As it enters the two rollers gripping the board between them feed it forward to the next pair, which act upon it in the same manner as the first. The board being now firmly gripped by the two sets of feed rollers the upper roller of each pair pressing upon it with a force corresponding to the tension of the spring, is forced endwise toward the opposite extremity of the machine. In this movement it passes first beneath the scoring and reducing irons, which being moved rapidly across its face remove from it the surplus wood and score its surface. The board is prevented from bending while under the action of these irons by the roller beneath. As the board leaves the scoring irons it passes between the endless chain of rollers and the roller which proceeds the first finishing plane. The roller presses the board firmly upon the endless chain beneath, while the rollers of the latter being put in motion by the friction of the board bearing upon them roll onward upon the bearers beneath. As the chain of rollers thus moves, those which arrive at the hinder extremity of the machine pass downward around the hinder drum and returning forward pass upward around the front drum to take their places beneath the board. As the board moves upon this rolling bed it passes beneath the roller mouth-pieces and the finishing planes. The former hold the board firmly upon the bed and prevent it from rising upon the plane irons. They also break the shavings as they rise, and, as they are supported from end to end, they hold the board firmly in the middle of its breadth as well as at its edges. The plane irons acting with a drawing cut quickly shave off the wavy surface left by the reducing and scoring planes and produce a smooth and finished surface. As the hinder extremity of one board enters the first pair of feed rollers the attendant introduces the front extremity of a succeeding one, which, following in the track of the first one, forces it through the machine and is planed by a repetition of the same operations.

From the arrangement of the upper feed rollers it is evident that the higher they rise the more the springs which press them downward will be compressed, and consequently the greater will be the force with which they grip the board; hence the pressure adapts itself to the varying thicknesses of different boards, the thicker boards

which can withstand a greater strain without buckling or bending, being acted upon with greater force, while the thinner boards are gripped with less force.

5 On an examination of the operation of the scoring planes it will be seen that they are moved by the crank directly across the board, while the latter is being forced end-
10 wise through the machine. This endwise movement of the board tends to carry the scoring planes along with them, and unless some compensating arrangement was introduced would press the plane stock forcibly against the hinder way of the carriage upon
15 which it slides, and would produce great friction. This defect is obviated by the arrangement of the plane stock within a secondary frame in which it can move in the same direction as the board, the actual
20 track described by the edges of the scoring planes under those two movements being oblique to the face of the board. As the scoring planes arrive at the end of their direct stroke the springs, which are arranged
25 in the secondary frame, move the plane stock forward in the frame to its original position, and, as the plane stock is drawn backward over the board, it turns upward upon its hinge and permits the edges of the scoring
30 planes to rise and glide over to the face of the board until they reach the side nearer the crank shaft when they drop to their proper positions for cutting.

The method of effecting the reduction of
35 the board by narrow planes acting transversely upon it is superior to the method of reducing it by planes acting longitudinally, for it has been found by actual trial that much less power is required to do the work.
40 It has also been found that but half the number of planes are required to finish the surface when the wood has been removed by the scoring planes. The scoring has also the effect of dividing the grain of the wood
45 and facilitating the breaking of the shaving removed by the first finishing plane, hence the latter may be set to cut a very rank shaving, and in this manner to do work which requires two or more planes when the
50 wood has not been previously scored. The removal of the surplus wood by transverse planes also has the effect of reducing all the boards to a uniform thickness before submitting them to the action of the finishing
55 planes, and as the office of the latter is merely to smooth the scored surface they are not subjected to the violent strains which is unavoidable when they have to effect the reduction as well as the finishing of the
60 board. They are not therefore strained or bent and they work with greater precision.

The roller mouthpieces I have described are superior to those hitherto employed for the following reason: It is well understood
65 that a mouthpiece to break the shaving ef-

ficiently must necessarily have a narrow bearing, and if the diameter of the roller be made sufficiently small to produce this narrow bearing, and be only supported at its extreme ends, it will bend under the
70 pressure and will permit the middle of the board to rise slightly upon the plane; hence more wood will be removed at this part than at the edges and a concave surface will be produced, while on the other hand, if the
75 diameter of the roller be made sufficiently great to obtain the requisite inflexibility the bearing upon the board is so broad that the shaving is not efficiently broken. These defects are obviated by the mouthpiece I have
80 described, in which the roller is of such small diameter that the shaving is efficiently broken while at the same time it is so firmly supported by the rests that it cannot yield to the pressure and consequently will pre-
85 vent the middle of the board from rising as well as its sides. By arranging the mouthpieces of the plane irons in such manner that the plane passing through their centers bisects the angle formed by the converging
90 faces of the board and plane iron it is evident that they will act in the same relative position with respect to the plane and board—whether the shaving be thin or
95 thick. This equability in their action is important, for it insures an equal finish in the boards planned by the machine.

The arrangement and operation of the finishing planes is also a great improvement upon preceding machines. On an examina-
100 tion of them it will be seen that they not only act with a drawing cut and thus sever the wood with a less expenditure of power, but that the moving mechanism is so arranged that the movement of one plane iron
105 in one direction is compensated in whole or in part by the movement of one or more of the others in an opposite direction; hence the tendency of the plane to draw the board toward that side of the machine to which it
110 is moving at the time is compensated by that of one or more of the others to move the board toward the opposite side of the machine; and consequently as these forces counteract each other the board will move
115 forward without deviating from the direction in which it is moved by the feed rollers.

The mechanism for raising and depressing the carriage to which the finishing planes are secured is both simple and effi-
120 cient. It is extremely convenient, as the carriage is raised simultaneously throughout its whole extent by turning a single crank. It is efficient because the relative positions of the plane irons are not varied by
125 the movement of the carriage and the latter is rigidly secured to the bed frame whatever be its position with respect to the bed beneath on which the board is supported.

The bed for supporting the board while 130

under the action of the finishing planes possesses two important properties. In the first place, it works with but little friction as the boards are carried upon the rollers of which it is composed and the latter roll onward over the rails, and in the second place it supports the board firmly, for the rollers are prevented from bending by the rails upon which they roll.

10 The various mechanical devices I have described may be modified both in arrangement and construction without departing from the principles of my invention. Thus for example the number of scoring irons 15 may be increased and they may be arranged in two sets which may work in opposite directions toward the center of the machine; or they may be arranged in sets each of which works upon but a narrow portion of 20 the board. This scoring mechanism is also applicable to machines in which the lumber is finished by rotating or stationary planes as well as to the machine I have described, but as the details of the mechanism for 25 carrying into effect these modifications will be obvious to the skillful machinist I shall not describe them particularly in this specification.

30 The rests which prevent the bending of the rollers of the mouthpieces, instead of being immovable, may be formed by friction rollers which arrangement will enable the machine to work with a less expenditure of power. The finishing planes may be arranged obliquely to the direction in which 35 the board is moved instead of at right angles to that direction. They may also have a curvilinear movement imparted to them in place of the rectilinear movement above 40 described. The bed which supports the

boards under the action of the finishing planes may be modified by forming it of a series of rollers supported at their extremities in stationary boxes and prevented from bending at intermediate points by friction 45 rollers which are arranged beneath them and upon which their barrels are supported.

What I claim as my invention and desire to secure by Letters Patent is—

1. The reciprocating plane for scoring 50 the face of the board transversely and reducing it to a uniform thickness, arranged substantially as herein described in a compound frame which carries the plane back and forth across the board by a regular and 55 positive motion and back and forth lengthwise of the board by a motion dependent upon the reciprocal action of the board against the planes in one direction and of springs against the frame in the opposite 60 direction substantially as herein set forth.

2. I also claim the method of smoothing the surface of boards or other lumber by plane irons reciprocating endwise and operated in such manner that the tendency of 65 one to draw the board toward that side of the machine to which it is moving is counteracted in whole or in part by the tendency of one or more of the others to draw the board toward the opposite side of the ma- 70 chine, these several counter tendencies being thus made to neutralize each other substantially as described.

In testimony that the foregoing is a full description of my said invention I have 75 hereunto subscribed my name.

JOHN HOWARTH.

In presence of—

W. G. RUSSELL,
P. H. WATSON.