(No Model.) 7 Sheets—Sheet 1.

H. KELLOGG.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING

No. 265,265. Patented Oct. 3, 1882.

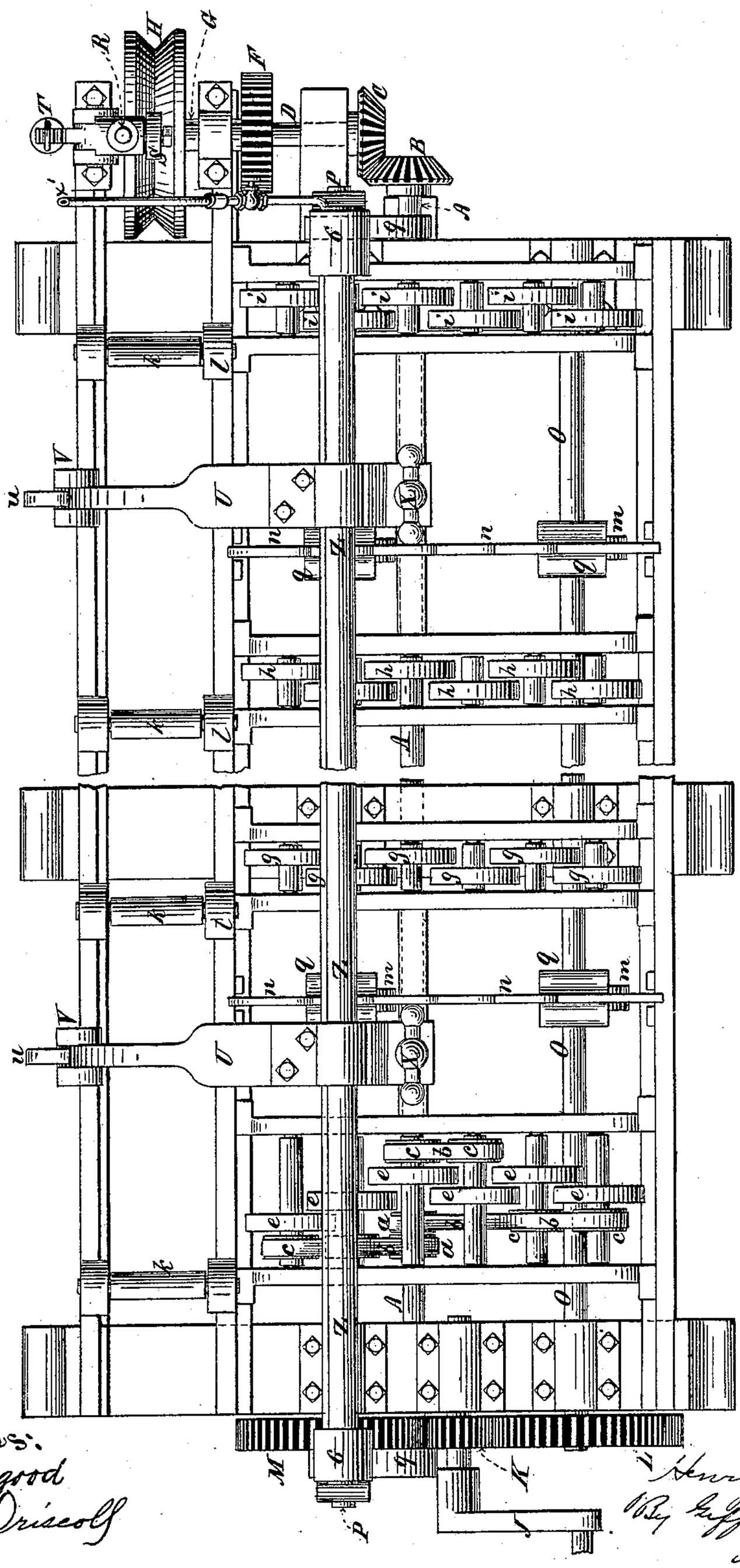

Figure 1.

Witnesses:
W. F. Hapgood
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(No Model.)

7 Sheets—Sheet 2.

H. KELLOGG.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

No. 265,265. Patented Oct. 3, 1882.

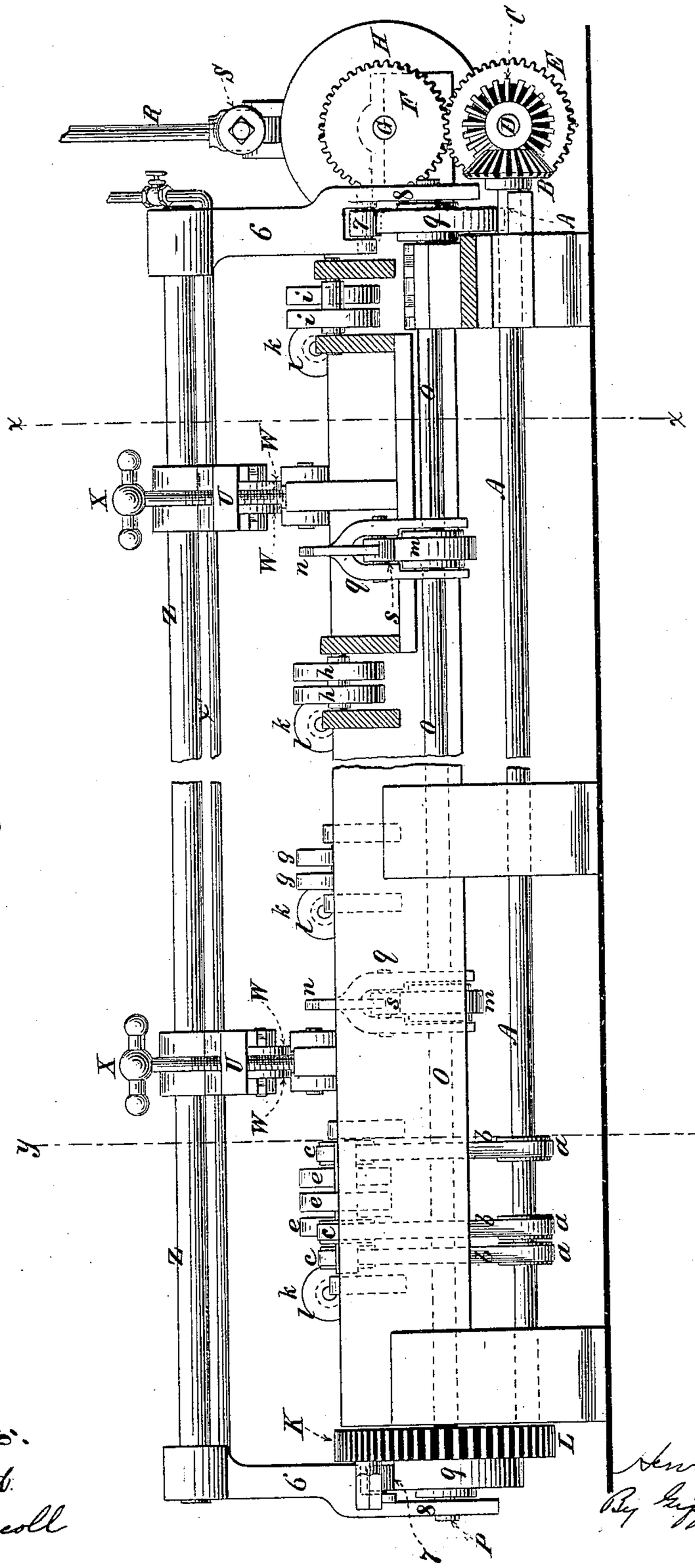

Figure 2.

Witnesses:
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(No Model.) 7 Sheets—Sheet 3.

H. KELLOGG.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

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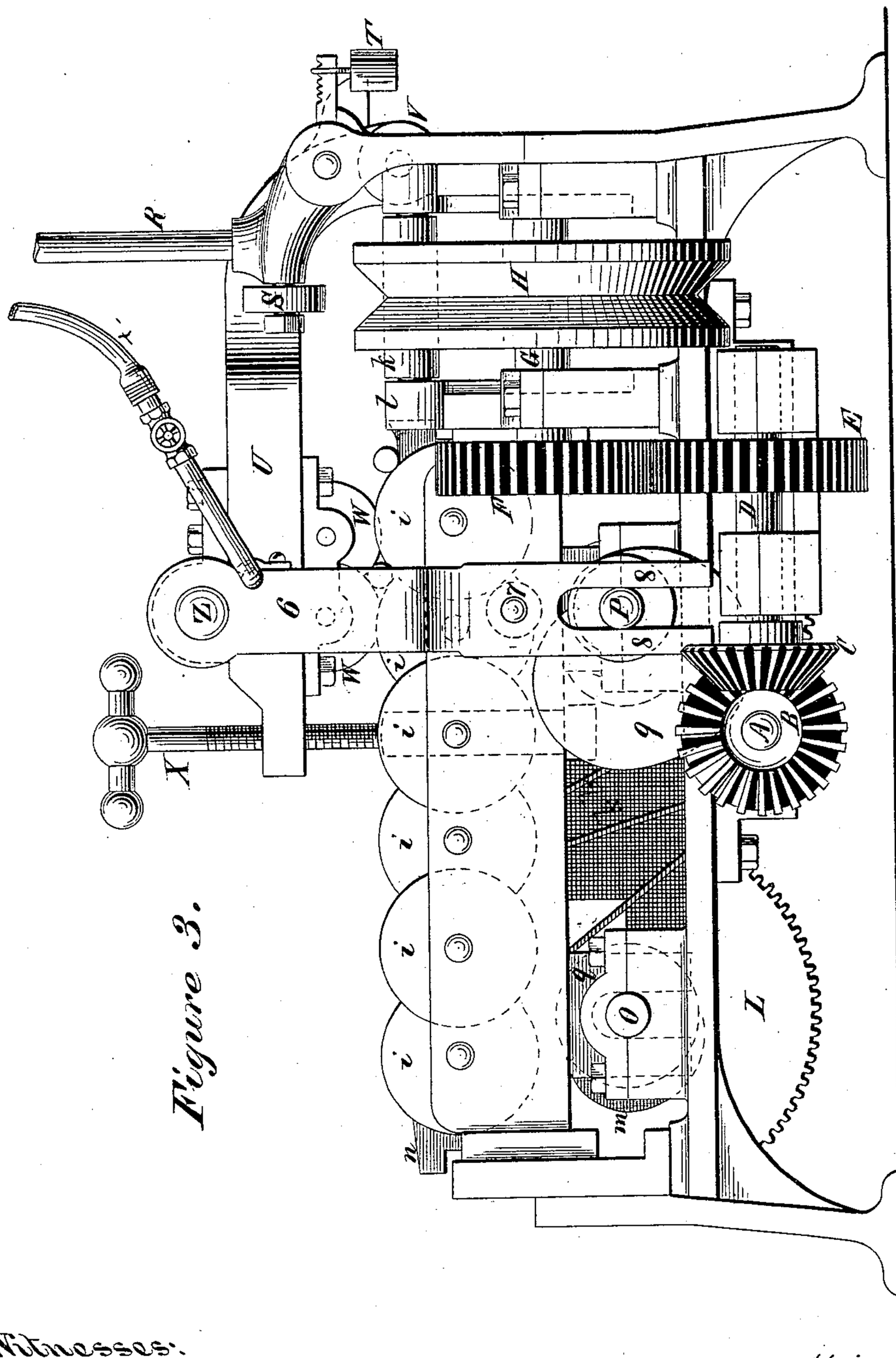

Figure 3.

Witnesses:
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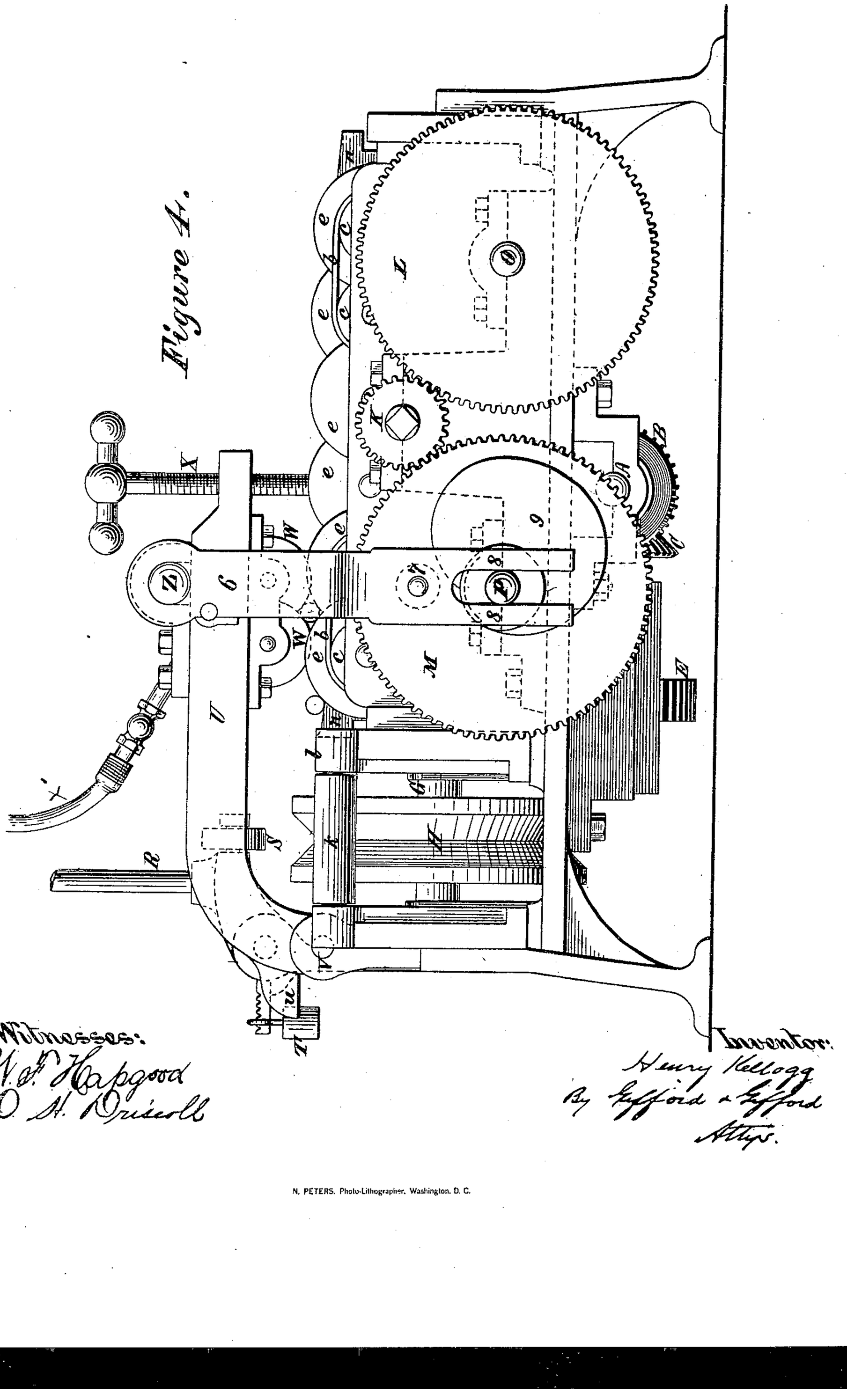
(No Model.) 7 Sheets—Sheet 4.

H. KELLOGG.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

No. 265,265. Patented Oct. 3, 1882.

Figure 4.



Witnesses:
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(No Model.) 7 Sheets—Sheet 5.

H. KELLOGG.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

No. 265,265. Patented Oct. 3, 1882.

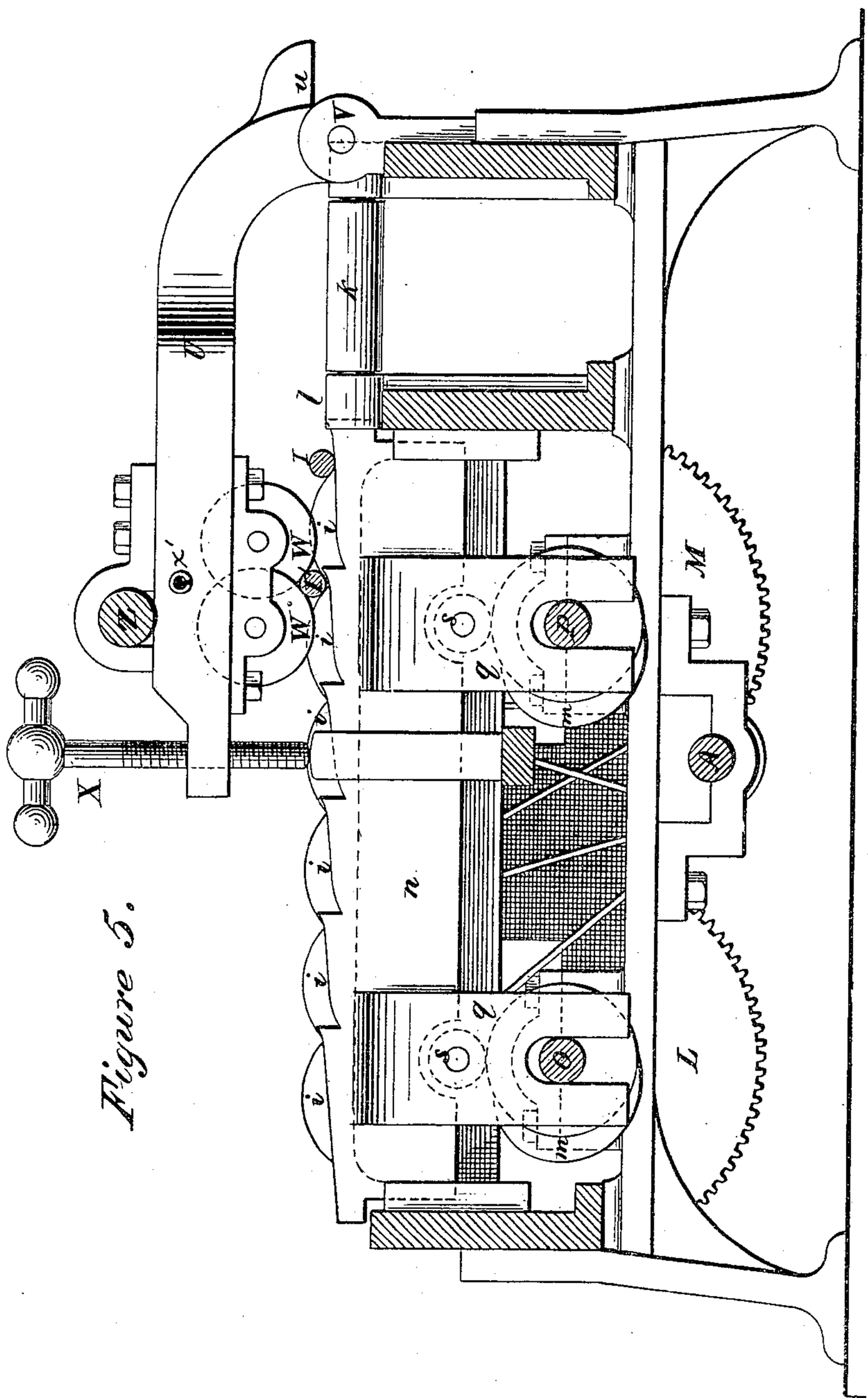

Figure 5.

Witnesses:
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(No Model.) 7 Sheets—Sheet 6.

H. KELLOGG.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

No. 265,265. Patented Oct. 3, 1882.

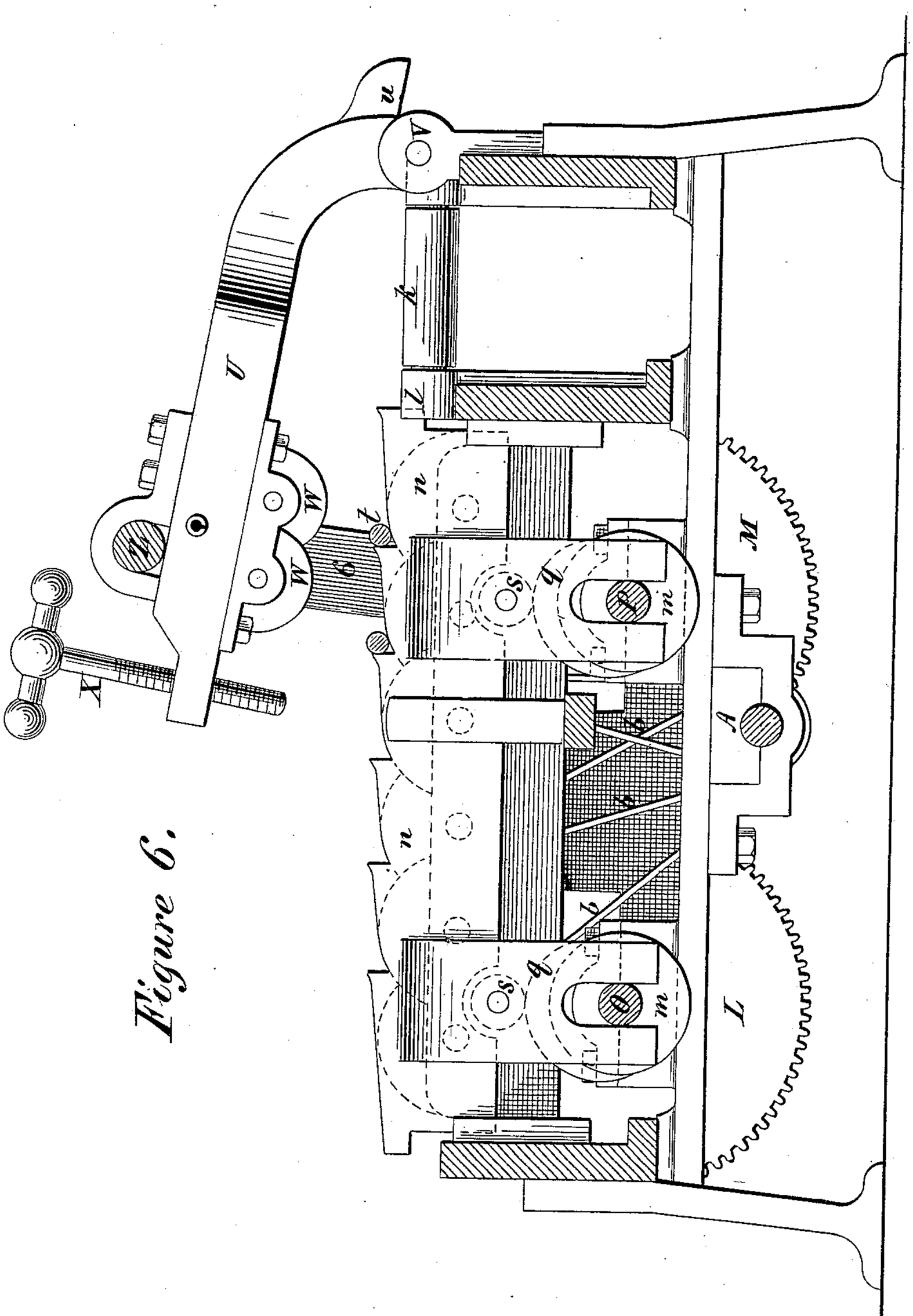

Figure 6.

Witnesses:
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(No Model.) 7 Sheets—Sheet 7.

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MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

No. 265,265. Patented Oct. 3, 1882.

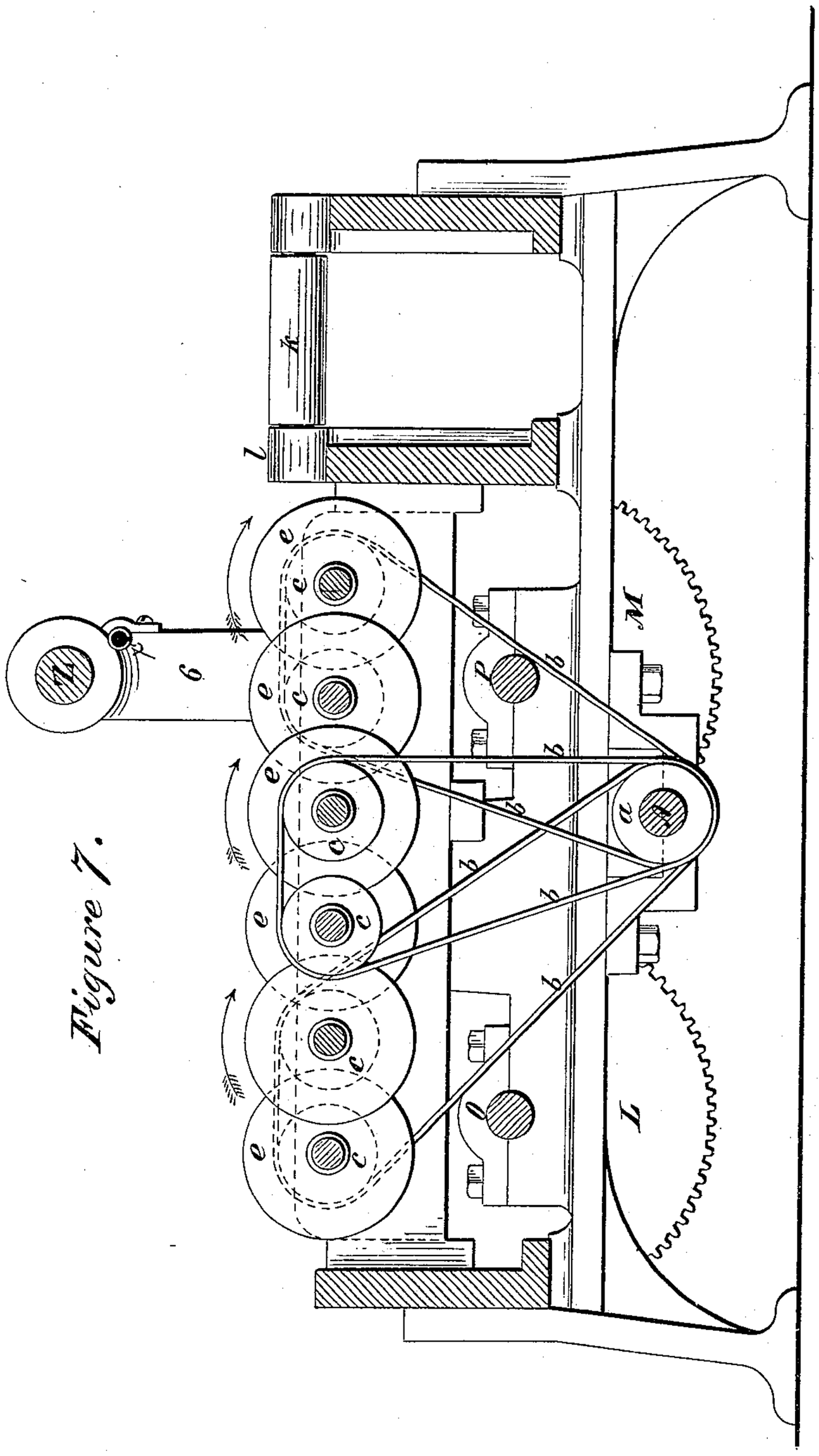

Figure 7.

Witnesses:
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O. A. Driscoll

Inventor:
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By Griffith & Gifford,
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UNITED STATES PATENT OFFICE.

HENRY KELLOGG, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO THE AKRON IRON COMPANY, OF AKRON, OHIO.

MACHINE FOR COOLING AND STRAIGHTENING METALLIC PIPING, BARS, OR SHAFTING.

SPECIFICATION forming part of Letters Patent No. 265,265, dated October 3, 1882.

Application filed May 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, HENRY KELLOGG, of the city of New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Machines for Cooling and Straightening Metallic Piping, Bars, or Shafting, of which the following is a specification.

After a pipe, bar, or shaft is finished by any of the ordinary methods it is frequently the case that it is so crooked as to need some subsequent straightening, and if it still remains at a high temperature after being finished, although it may be perfectly straight when first finished, it is liable to become crooked, either by reason of unequal cooling or by reason of a defective support, causing some portion to sag lower than another. Furthermore, if the pipe, bar, or shaft has been polished its surface while still heated is soft and very likely to be scratched and damaged.

The object of my invention is to provide a machine which will cause all parts of the pipe, bar, or shaft to be cooled equally, and so support all parts of the pipe, bar, or shaft that no part sags below another, while the machine is so made as not to scratch or otherwise damage the polished surface of the iron. I also provide my machine with mechanism which, if necessary, may be used to straighten.

My machine is especially designed for the treatment of piping, bars, or shafting which has been polished by being passed longitudinally between annular grooved rolls substantially like those shown in Letters Patent No. 9,385 of reissues.

I will now describe the construction of my machine as I prefer it, reference being made to the accompanying drawings, in which—

Figure 1 is a plan view. Fig. 2 is a side view. Fig. 3 is a view of the end at which the bar enters the machine. Fig. 4 is a view of the other end. Fig. 5 is a vertical section through the line *x x* of Fig. 2, the rack and straightening-rolls being in their lowest position. Fig. 6 is a view of the same thing as Fig. 5, excepting that the rack and rolls W W are in their highest positions. Fig. 7 is a vertical section through the line *y y* of Fig. 2.

The central part of the machine is omitted in the drawings, which represent both ends of the machine. The machine may be any length desired, the central part being a duplication of the supporting parts shown.

A is a shaft resting in suitable bearings and running longitudinally through the machine, and to which rotary motion is to be communicated by any suitable power. This shaft A is provided at one end with a bevel-wheel, B, which gears into another bevel-wheel, C, on the shaft D, which extends at right angles with the shaft A. Secured to this shaft D is a spur-wheel, E, which gears into the spur-wheel F, situated above it and secured to the shaft G. Secured to this shaft G is also the wheel H, which is made of iron or steel, and is provided with a V-shaped groove on its periphery, of proper shape and size to receive and guide the bar, pipe, or shaft as it enters the machine.

a a a are pulleys secured to the shaft A. These pulleys are connected by the belts *b b b* with other pulleys, *c c c c c c*. Secured to the same shafts with these latter pulleys are the wheels, rollers, or trollers *e e e e e e*, which are referred to herein as cooling-rollers. Said cooling-rollers are all of the same size, and are so arranged as to overlap one another, with their axes in the same horizontal plane. In operation they all revolve in the same direction and in unison with each other. Having their axes of rotation in the same horizontal plane, and being of the same size as the rollers above described, are other sets of cooling-rollers. (Marked in the drawings with letters *i*, *h*, and *g*, respectively.) These other sets of cooling-rollers may be merely friction-rollers, and are situated at regular distances apart along the top of the machine—say two feet apart. Any number of these sets of cooling-rollers may be caused to revolve by power in the manner described in relation to the set of rollers marked *e*, depending upon the length of the machine and the length of bar being treated. As a rule, however, it will be found sufficient to revolve two sets of the cooling-rollers, and allow the other sets to be revolved merely as friction-rollers by the motion of the bar lying on them. The cooling-rollers in each set are arranged so as to overlap one another,

with such a distance between their axes that the pipe, bar, or shaft will rest at the same time on two rollers in each set, so as to occupy the position with reference to the rollers shown at I′, Fig. 5. All of the rollers being of the same size and having their axes in the same horizontal plane, the bar is thus supported at short distances throughout its length, by two rollers in each set, in a horizontal position.

k k k k are horizontal friction-rollers, having suitable bearings, and arranged about two feet apart in such position as to be directly in front of the wheel H. These rollers I call "receiving-rollers." Said receiving-rollers are all on the same level, and on a level with the under side of the bar as it enters the machine over the wheel H. The tops of the bearings *l* of the receiving-rollers are on a level with the tops of the receiving-rollers, so that a bar may be rolled from the rollers onto and over the bearings without difficulty.

K is a spur-wheel operated by a crank, J, or any other suitable power, and which gears into the two spur-wheels L and M, which are respectively secured to the shafts O and P. On each of these shafts O and P, and between every two sets of cooling-rollers, are secured cams *m m*. Above these cams, and extending transversely across the machine between every two sets of rollers, are racks *n n*. These racks are metallic plates about one-half inch in thickness and about six inches broad, set up edgewise and provided on their upper edges with serrations of the form shown in the drawings. One edge of each of these serrations is substantially perpendicular, while the other slightly inclines downward from the horizontal. The racks are so arranged in the machine that when a bar lies on the cooling-rollers—as, for instance, in the position represented at I′, Fig. 5—it is directly above the inclined sides of a row of serrations, at a very short distance from their apexes. The inclined side of each serration from the point which will be directly below the bar in the position above referred to to the apex of the serration is slightly curved upward, as shown in the drawings. Extending downwardly from the lower edges of these racks, so as to surround the cams *m m* on the shafts O and P, are metallic boxes *q q q q*. The arms of these boxes project down on each side of the cams, each arm being provided with a slot which receives the shaft on which the cam is situated, so as to admit of the arm having free play up and down. Situated in the top of each box, and resting on the cam, is a friction-roller, *s*. The cams are given just sufficient eccentricity to lower the rack into the position shown in Fig. 5 when the bars rest on the cooling-rollers, or to raise the rack into the position shown in Fig. 6 when it is so high that it lifts the bar entirely clear of the cooling-rollers. The ends of the racks on the side of the machine at which the bars are received are so constructed and arranged that when the racks are in their lowest position the upper edges of the racks opposite the bearings *l* are on a line with the tops of the bearings *l* of the friction-rollers *k k k k*, and extend out so far as to just overlap those bearings, so that a bar may readily be rolled from the friction-rollers *k k k k* over the bearings *l l* and onto the racks *n n*. The ends of the racks on the side of the machine where the bars are delivered are so constructed and arranged that when the bar is lifted over the last row of cooling-rollers it will rest on the inclined edge of the last serration of the rack, and will therefore by its own weight roll off of the machine onto any receiving device which may be prepared for it.

On one side of the wheel H, and hinged to the frame of the machine, is a hand-lever, R, which is provided with a friction-roller, S. This hand-lever is so arranged that when it is thrown forward the roller S comes directly over the groove in the periphery of the wheel H, and when the lever is thrown backward the roller S is in such a position as not to interfere with the operation of the other parts of the machine. The object of this hand-lever R is to cause the friction-roller S to press the bar which is entering the machine lightly against the groove of the wheel H, thus creating sufficient friction between the bar and the wheel H to cause the rotation of the wheel to feed the bar into the machine.

To an arm extending out from the lever R, on the opposite side of the fulcrum of said lever from the wheel S, is attached a weight, T, which acts as a counter-balance to the weight of the lever and throws it back whenever it is not pressed forward by the hand. The weight of the bar will, however, generally, except at the first end, create sufficient friction on the wheel H, without the assistance of the lever R to feed the bar along. When it is desirable to still further straighten the bar after it has entered the machine I add to the machine other apparatus, which I will now proceed to describe.

U U are weighted levers, hinged to the frame of the machine at V V and extending out transversely over the machine between every two sets of cooling-rollers, as between the set of rollers marked *h* and the set marked *i* in the drawings. On the under side of the levers U U, and in such position as to be directly over the bar as it lies across the first and second rows of rollers, (by which I mean the first two rollers of every set,) are arranged friction-rollers W W, overlapping each other, and so arranged that a line drawn through the points where the peripheries of the friction-rollers of the various levers U U cross each other would, when the levers are in their lowest position, be perpendicularly opposite a line drawn through the points where the peripheries of the first two rollers of each set of cooling-rollers cross each other. These straightening-rollers are made adjustable lengthwise on the levers U U, so that they may be adjusted in proper position for different sizes of bars. Through the end of each lever U passes a set-screw, X, so that when the lever U is in its lowest position

required the lower end of the set-screw X rests upon a stop attached to the frame of the machine, and the lever is prevented from descending any lower. This set-screw has a threaded connection with the lever U, and therefore by screwing it up or down in the lever the position of the lever U may be changed as the circumstances require.

Extending longitudinally over the machine, and secured to the top of each of the levers U U, &c., is a bar or rod, Z. By lifting the bar or rod Z, therefore, all of the levers U U are simultaneously lifted. This bar or rod Z is so arranged as to be perpendicularly over the shaft P. On each end of the bar or rod Z is secured a downwardly-projecting arm, 6. On the lower end of each of these arms 6 is placed a friction-roller, 7, which should be a short distance above the shaft P. Extending still farther down from one side of the arm 6 and the friction-roller 7 is a slotted extension, 8, which receives the shaft P in its slot and prevents lateral movement of the arm 6, while at the same time it permits of the free vertical movement of the arm 6. On the shaft P are secured two cams, 9 9, one directly below the friction roller 7 of each arm 6. As the shaft P revolves the cams 9 9 act upon the friction-rollers 7 7 of the arms 6 6, causing those arms to rise and fall in a perpendicular direction. This rising and falling motion of the arms 6 6 is communicated to the bar or rod Z, and by it to each of levers U U. Each time therefore that the shaft P revolves the levers U U are raised and lowered once. It will be also remembered that each time the shaft P revolves once the shaft O also revolves once, and the rotation of those shafts, through the medium of the cams *m m m*, causes the racks *n n* to rise and fall once for every rotation of the shafts O and P. The object is to have the upward and downward motion of the racks *n n* in unison with the upward and downward motion of the levers U U, and therefore the cams 9 9 are arranged so as to create motion in the same direction as the cams *m m*. The cams 9 9, however, should be so placed and formed as to begin to raise the arms U U just before the cams *m m* begin to raise the racks *n n*, and to let the arms U U down in their lowest position just after the racks *n n* have reached their lowest position. The eccentricity of the cams 9 9 should also be greater than the cams *m m*, so as to raise the arms U U through a greater distance than the racks *n n* are raised, and thus raise the lower ends of the set-screws X above the top of the bars on the machine. *w* is a stop on the arm U, which prevents the arm U from going too far back.

The operation of the machine is as follows: Power is applied to the shaft A, causing it to revolve. This power is communicated through the chain of wheels B, C, E, and F to the grooved wheel H, which is thus caused to revolve. The power from the shaft A is also communicated by means of the pulleys *a* to the pulleys *c*, and thence to the cooling-rollers *e*, and, if need be, from other pulleys on the shaft A in a similar manner to other sets of cooling-rollers corresponding with those marked *e*. In this way the rollers connected with the shaft A are all made to revolve in the same direction, the preferable direction being that indicated by the arrow in Fig. 7. The set-screws X are next adjusted, so that when the lower end of each set-screw rests on the stop attached to the frame of the machine the friction-rollers W W on all the levers U U would just press the surface of a perfectly straight bar of the size about to be treated, if such perfectly-straight bar lay across the first two cooling-rollers of each set. Next the end of the bar to be treated is placed in the groove of the roller H to be fed into the machine, and, if need be, the hand lever R is brought forward, so that the friction-roller S presses on top of the bar. The revolution of the wheel H feeds the bar along into the machine, where it is received on the friction-rollers *k k k k*. The attendant next by a slight push causes the bar to roll over the bearings *l l l l* onto the racks *n n*, where it rests, partly on the racks and partly on and against the first row of cooling-rollers, in the position represented at I′, Fig. 5. The attendant next turns the crank on the wheel K, sufficiently to give the shafts O and P one revolution, the effect of which is to cause the racks *n n* and levers U U to rise and fall once by the action of the cams *m m m m* and 9 9. The raising of the racks in the manner above described lifts the inclined surface of the racks on which the bar rests, as at I′, above the top of the first row of cooling-rollers and causes the bar to roll down those inclined surfaces until it rests against the face of the first row of serrations, as at Fig. 6. As the rack falls again, however, the bar is caught on the first row of cooling-rollers and raised above the apexes of the first row of serrations of the racks. The bar then rolls down the inclined peripheries of the first row of cooling-rollers until it comes in contact with the second row of cooling-rollers, and in doing so it passes by the apexes of the first row of serrations and reaches the position as indicated at I′, Fig. 5. As soon as it reaches that position the cams 9 9 allow the arms U U to descend until the lower ends of the set-screws X X rest on their stops on the frame of the machine, in which position of the arms U U, it will be remembered, the friction rollers W W are just high enough to admit of a perfectly-straight bar of iron of the size being treated, being in the position shown at I′, Fig. 5. While the bar is in contact with the cooling-rollers it is constantly rotated by them, and if at all crooked the pressure of the friction-rollers W W, acting on the crooked portion between the supporting cooling-rollers, will straighten it. A perforated water-pipe, X′, is arranged in position above the bar as it is under the straightening-rollers W W, so that while the bar is revolving under the pressure of the straightening-rollers W W, and is thus held perfectly straight, the attendant may ad-

mit water into the perforated water-pipe, whence it will be distributed over the whole length of the bar. The result of this is that the bar is rapidly cooled while retained perfectly straight between the straightening and cooling rollers, and made to take its set in that position. After the bar has been on the first and second rows of cooling-rollers, as at I′, Fig. 5, for a sufficient length of time the attendant again turns the crank attached to the wheel K sufficiently to give the shafts O and P a revolution. This causes the cams 9 9 to lift the arms U U and the friction-wheels W W off of the bar, and also causes the cams *m m m m* to lift the racks *n n*, so that the bar is allowed to roll on the second row of cooling-rollers against the faces of the second row of serrations, where the bar remains until the descent of the rack allows the bar to roll on the second row of cooling-rollers until it rests between the second and third rows of cooling-rollers. In the same manner, by turning the crank attached to the wheel K as often as desired, the attendant may cause the bar to pass over each row of cooling-rollers until it has passed over the last row, when it will roll off of the machine over the inclined edges of the racks.

It is apparent that as many bars may be in the machine at a time as there are rows of cooling-rollers, because as soon as one bar has reached the position shown at I′, Fig. 5, another bar may have been fed into the machine onto the receiving-rollers *k k k k*, and when the machine is filled with bars in this manner one turn of the shafts O and P will cause each bar to pass on to the next succeeding row of cooling-rollers, until it finally passes off of the machine.

If, as is the case with the machine represented in the drawings, many of the sets of cooling-rollers are not rotated by power obtained directly from the shaft A, those which are not so rotated act as friction-rollers, and are rotated by the bar, the bar being rotated by those rollers which are operated by the power obtained from the shaft A.

It will be seen that my machine supports the bar along its whole length at such short distances that no part of the bar is allowed to sag lower than another. It also supports and moves the bar in such a way that the surface of the bar remains uninjured. It also keeps the bar revolving, so that no side of the bar is allowed to remain in contact with cooler atmosphere than another, and it thus prevents any warping of the bar, because it causes all sides of the bar to be equally cooled. It also provides for straightening the bar, if that shall be necessary.

It is obvious that without evading my invention the construction of my machine may be varied in many ways that will readily suggest themselves to a skilled mechanic; but I have described and shown the construction which I believe to be preferable.

The capacity of the machine may be increased or diminished by increasing or decreasing the number of cooling-rollers, and sufficiently good results, especially on large bars, may frequently be obtained by dispensing with the straightening apparatus altogether and using the balance of the machine without it. If the bar is in a heated state, its own gravity will tend to straighten it while it revolves on the cooling-rollers.

Apparatus might also be applied to my machine to operate the wheel K at suitable intervals by power received from the shaft A or any other source.

It is also obvious that other apparatus than that shown might be used for feeding the bar into the machine.

It is also obvious that other means than the rack might be used for passing the bars from one row of cooling-rollers to another.

What I claim is—

1. In a machine for cooling rods or bars, the series of sets of cooling-rollers arranged to support two or more bars simultaneously and keep them revolving, substantially as described.

2. In a machine for cooling rods or bars, the combination of the cooling-rollers with the racks, so arranged that the movement of the racks causes the bar to be raised, permitting it to roll from one row of cooling-rollers to another, substantially as described.

3. In a machine for cooling rods or bars, the combination of the cooling-rollers and the receiving-rollers *k*, substantially as described.

4. In a machine for cooling rods or bars, the combination of the cooling-rollers with the receiving-rollers and the feeding-roller H, substantially as described.

5. In combination with the cooling-rollers, the two sets of straightening-rollers W W, arranged to press upon the bar opposite to the supporting-rollers and straighten it, substantially as described.

6 In combination with the cooling-rollers and the racks, the straightening-rollers, arranged to be moved in unison with the motion of the racks, as and for the purpose described.

7. In combination with the cooling-rollers and the two sets of straightening-rollers, the distributing water-pipe, arranged to drop water between said straightening-rollers, substantially as described.

8. In a machine for cooling rods or bars, the cooling-rollers arranged in rows, said rows being substantially in the same horizontal plane and arranged transversely to the machine-frame to receive the weight of and support the bar at separate points along its length and keep it rolling, while its surface is exposed on all sides between the rollers for cooling by the circulation of air in contact with it, substantially as described.

HENRY KELLOGG.

Witnesses:
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JAMES S. THOMPSON.