5 Sheets—Sheet. 1.

C. VAN HAAGEN.

Cutting and Shaping Metals.

No. 110,609. Patented Dec. 27, 1870.

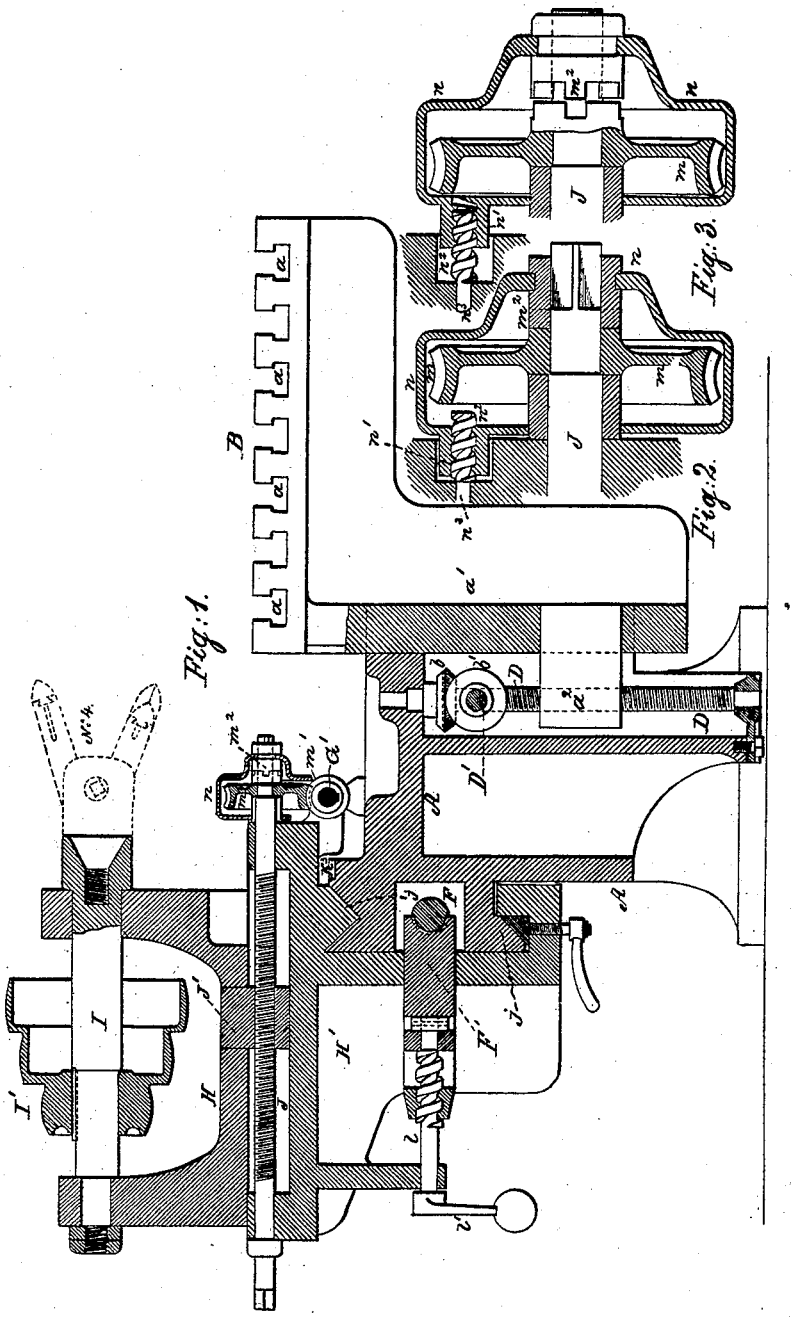

Fig. 1.

Fig. 2.

Fig. 3.

Witnesses.
Wm. Steel.
John Parker

Claus Van Haagen
by his attys
Howson & Sons

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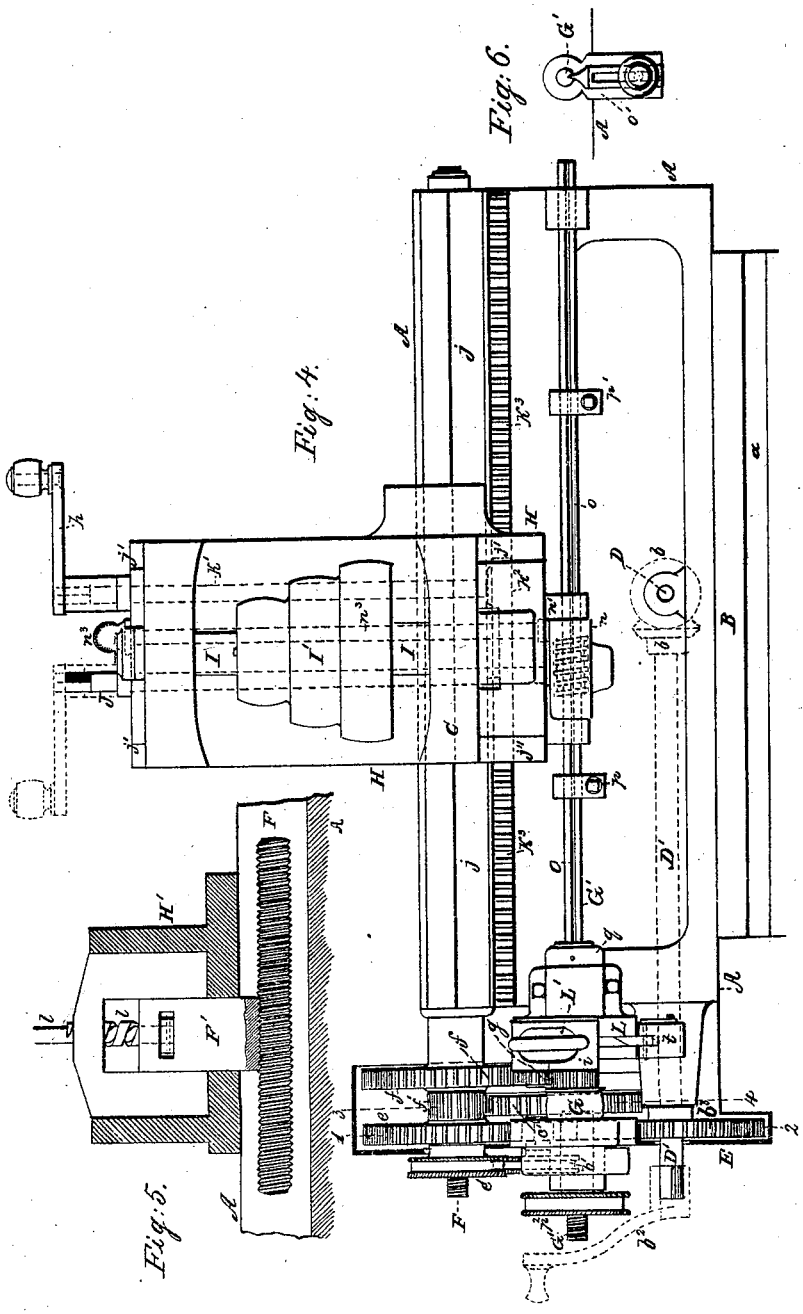

Fig. 4.

Fig. 6.

Fig. 5.

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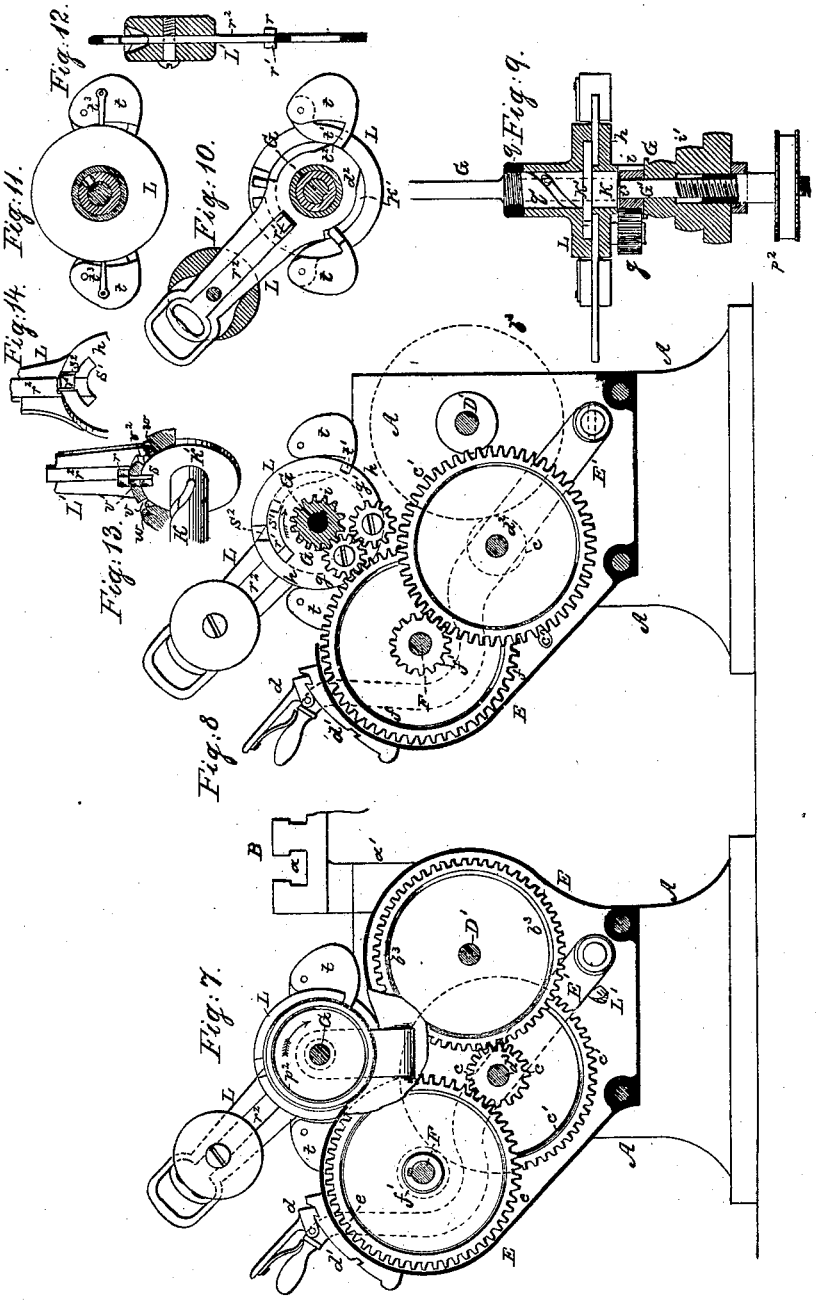

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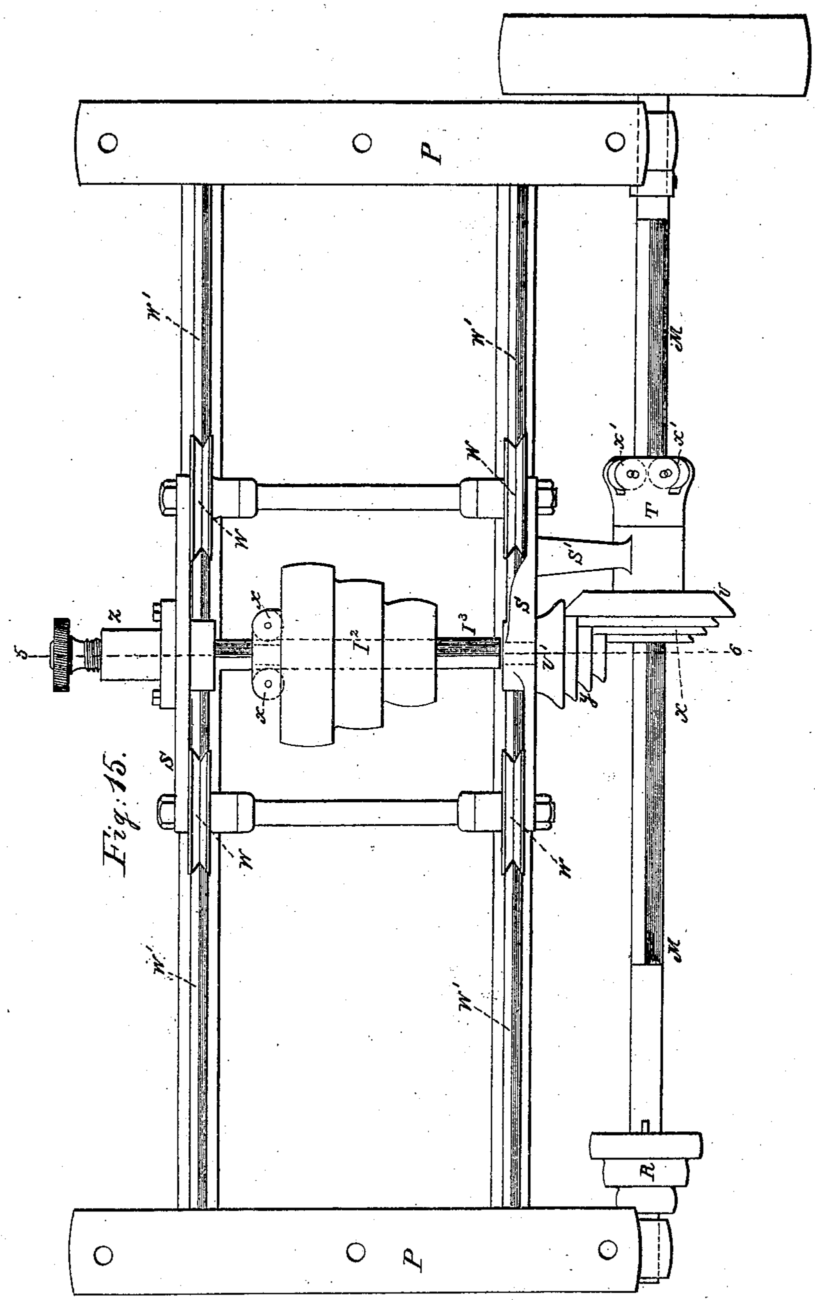

Witnesses { Wm A. Steel.
John Parker

Claus Van Haagen
by his attys
Howson and son

5 Sheets—Sheet. 5.

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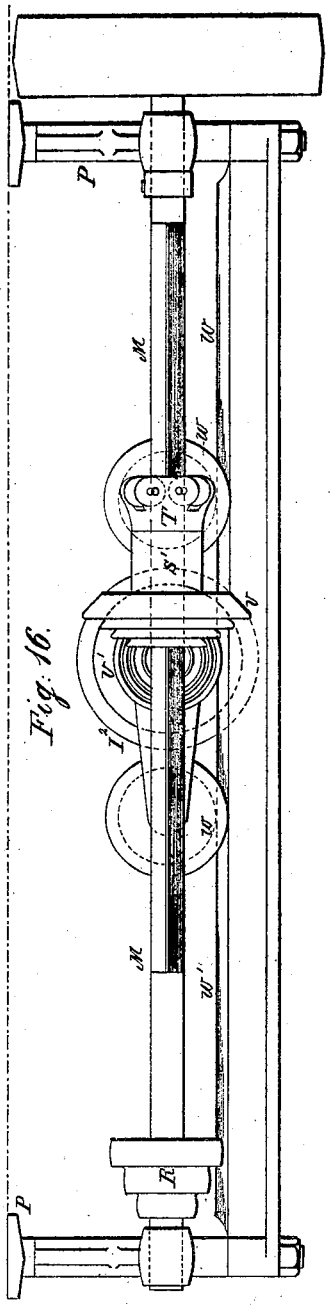

Fig: 16.

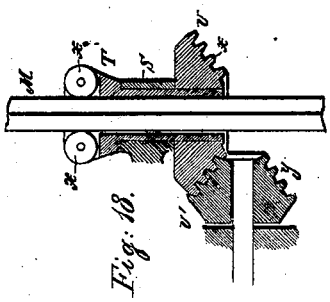

Fig: 18.

Fig: 19.

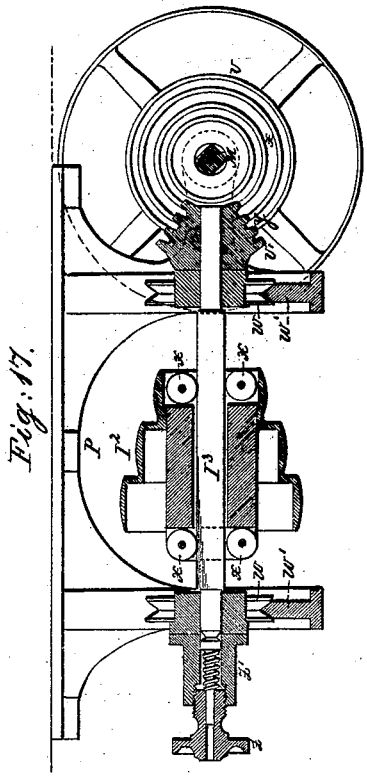

Fig: 17.

Witnesses { Wm A Steel. John Parker

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United States Patent Office.

CLAUS VAN HAAGEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND ANTHONY VAN HAAGEN, OF SAME PLACE.

Letters Patent No. 110,609, dated December 27, 1870.

IMPROVEMENT IN MACHINES FOR CUTTING AND SHAPING METALS.

The Schedule referred to in these Letters Patent and making part of the same.

I, CLAUS VAN HAAGEN, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented an Improved Machine for Cutting and Shaping Metals, of which the following is a specification.

Nature and Object of the Invention.

My invention consists of mechanism too fully described hereafter to need preliminary explanation, for planing, boring, turning, or grooving metals, the main object of my invention being to provide machine-shops, and especially repairing-shops, with a tool for a variety of purposes, which have heretofore required separate machines.

Description of the Accompanying Drawing.

Figure 1, sheet 1, is a transverse vertical section of my improved machine for cutting and shaping metals.

Figures 2 and 3, enlarged views of a part of fig. 1.

Figure 4, sheet 2, a plan view of the machine.

Figure 5, an enlarged sectional plan view of part of the machine.

Figure 6, a detached view of part of one end of the machine.

Figure 7, sheet 3, a transverse vertical section on the line 1 2, fig. 4;

Figure 8, a transverse section on the line 3 4, fig. 4.

Figures 9, 10, 11, 12, 13, and 14, detached views of parts of the machine.

Figure 15, sheet 4, is a plan view of the hanger, squared line-shaft, and traveling carriage, from which power is transmitted to the machine.

Figure 16, a side view of fig. 15.

Figure 17 is a transverse section of the same on the line 5 6; and

Figures 18 and 19 are detached views.

General Description.

A, a cast-iron bed of the machine;

B, a movable table attached to the front of the same; and

H and H^1, a head-stock and slide at the rear.

The table B, which is intended to carry the object or objects to be operated upon, is arranged to move vertically, and the head-stock H is furnished with a revolving spindle, and is arranged to be moved both longitudinally and transversely. All or any of these movements can be imparted to the table and head-stock by hand, or automatically, as I will now proceed to describe.

The table B has the usual longitudinal slots *a*, for convenience in securing the work to the same by T-headed bolts, in the usual manner, and the vertical portion a^1 of the table is adapted to and arranged to slide vertically in U-shaped guides on the bed of the machine.

This vertical movement is imparted to the table by a screw-spindle, D, fig. 1, which has threads adapted to the internal threads of a nut, a^2, secured to the table.

At the upper end of the screw-spindle D there is a bevel-wheel, *b*, which gears into a bevel-wheel, b^1, on a horizontal shaft, D^1, arranged to turn in the bed of the machine, and having, at its outer extremity, a crank, b^2, shown by dotted lines in fig. 4, by which the said shaft can be turned.

The shaft D^1 has also, within a casing, E, at one end of the machine, a cog-wheel, b^3, figs. 4 and 7, which gears into a pinion, *c*, hung to an arm or lever, E', fig. 7, by the operation of which the said pinion can be thrown in or out of gear.

This lever has, at its outer end, a spring latch, *d*, adapted to a notched segmental plate, d^1, on the casing E, by which the said lever can be locked and prevented from moving when adjusted, (see figs. 7 and 8.)

The pinion *c* turns loosely upon a short spindle, d^2, on which is also hung loosely a cog-wheel, c^1, of considerably larger diameter than the pinion *c*. The latter and the cog-wheel may turn independently of each other, or may be forced tightly together by means of a nut on the spindle, so as to cause them to turn simultaneously.

The pinion *c* gears into a cog-wheel, *e*, which can slide, to a limited extent, upon, but is prevented from turning independently of, a shaft, F, which has a screw-thread throughout the greater portion of its length, and forms part of the longitudinal feed-motion of the slide H^1.

There is also upon the screw-shaft F, adjacent to the cog-wheel *e*, a pinion, f^1, and cog-wheel F, which are secured together, but hung loosely upon the shaft, so that they may turn independently of the cog-wheel *e*. The latter can, however, by means of a nut, e^1, be forced tightly against the pinion, so as to be driven by the latter, in order to turn the screw-shaft.

The pinion f^1 gears into the cog-wheel c^1, before referred to, and the cog-wheel *f*, by which the pinion is driven, receives its motion (through the medium of one of two small pinions, *g* g^1, hung to a movable disk, *h*,) from a fixed cog-wheel, *i*, on the driving-pulley G of the machine, the said pulley G being driven by a cone-pulley, R, on a shaft above, as hereinafter explained.

By means of the above-described mechanism the table B may be lowered by a motion of the driving-shaft in the direction of the arrow, figs. 7 and 8, and, in order to raise the said table by the same motion of the driving-shaft, the direction of the motion of the train of wheels must be reversed by so adjusting the disk h as to throw the pinion g^1 into gear with the cog-wheel f, and thus interpose two pinions between the latter and the cog-wheel i on the driving-shaft, instead of one only, as before described.

The head-stock H is adapted to the slide H^1, which is arranged to slide upon guides j on the bed of the machine, and the head-stock carries a spindle, I, with a cone-pulley, I^1, and is arranged to slide transversely from or toward the table B upon guides j^1 on the slide H^1.

The slide H^1, with its head-stock, may be caused to traverse the guides j, by manipulating a crank, k, fig. 4, on a spindle, k^1, which has at its opposite extremity a cog-wheel, k^2, gearing into a rack, k^3, on the bed of the machine, or the said slide and head-stock may be caused to slide automatically and in either direction upon the guides j, by means of a screw-shaft, F, which gears into a half nut, F^1, on the slide H^1, as shown in figs. 1 and 5, the said nut being so controlled by a screw-spindle, l, having threads of a coarse pitch, that it can be readily drawn back from the screw F, when it is desired to operate the slide by hand.

This screw-spindle l is provided with an operating-handle, l^1, the weight at the end of which tends to maintain the half nut in the position to which it may be adjusted.

The head-stock can always be operated either automatically or by hand, through the medium of a screw-spindle, J, and nut J', fig. 1.

The spindle J turns in the slide H^1, and has at its inner end a worm-wheel, m, gearing into a worm, m^1, which is arranged to slide upon, but not to turn independently of, a shaft, G^1, which forms a continuation of and one end of which passes through the tubular driving-pulley, G, (see fig 9.)

The worm-wheel m is hung loosely to the screw-spindle J, but is adapted to a clutch, m^2, figs. 2 and 3, on the squared end of the spindle, and is controlled by a casing, n, which entirely incloses the worm-wheel.

Projecting from and forming part of this casing is a nut, n^1, to which is adapted a coarse screw-thread, n^2, on a rod, n^3, in such a manner as to push the said casing outward, and thus disengage the clutch from the worm-wheel, when the screw-spindle J is to be turned by hand, or to draw it inward and again cause the clutch to engage with the worm-wheel, when the screw-spindle is to be operated by power, this rod n^3 terminating in a knob at the rear of the head-stock.

The reversing mechanism or means of operating the disk h automatically or by hand, so as to throw either of the pinions g or g' into gear with the cog-wheel f or both out of gear, forms an important feature of my invention, and may be described as follows:

The shaft G^1 has a longitudinal slot or groove, o, which permits the worm m^1 to slide upon, but not to turn independently of the said shaft, as before mentioned, and at one end of the bed of the machine there is an adjustable latch, o^1, fig. 6, the point of which can be extended into the said groove o, in order to prevent the shaft from turning without interfering with any longitudinal movement that may be imparted to the same by the slide H^1, which, as it reciprocates upon the guides j is arranged to strike successively adjustable stops p and p^1, secured to the said shaft by set-screws or otherwise.

This longitudinal movement of the shaft G^1 through the tubular driving-shaft is only permitted when a nut, p^2, at the end of the said shaft, (which nut has a sleeve extending into a recess in the driving-pulley,) is drawn back or loosened, as shown in fig. 9, and the said nut must be tightened to clamp the driving-pulley between the nut and the shoulder i^2 on the shaft G^1, when it is desired to rotate the shaft G^1 with the driving-pulley.

The disk h vibrates upon a sleeve, K, which is fitted loosely upon the shaft G^1, and is contained within a casing, L, which is secured to the bed of the machine.

The said sleeve is prevented from sliding with the shaft G^1 in either direction by a nut, q, which is in contact with the end of the casing, and by a disk, x^1, contained within the said casing adjacent to the disk h.

The sleeve K has a spiral slot, g^1, to which is adapted a pin on the shaft G^1, so that as the latter is moved longitudinally, a limited rotary motion in one direction or the other must necessarily be imparted to the sleeve and its disk k^1.

In order to impart this movement of the disk k^1 to the disk h, to which the pinions g and g^1 are attached, an arm or "shifter," L^1, hung to a short hub on the inner side of the disk h between the latter and the disk K^1, is employed.

This shifter has upon one side a pin, r, adapted to a notch, s, on the edge of the disk k^1, and at its opposite side a corresponding pin, r^1, adapted to a slot, s^1, in the disk h, (see figs. 13 and 14.)

By means of this arrangement the shifter is operated by the slightest movement of the disk k^1; but in consequence of the last motion in the slot s^1 the disk h is not turned so as to throw the pinions g and g^1 in and out of gear with the cog-wheel f until the shaft g^1 has nearly completed its longitudinal movement in one direction or the other.

This enables the shifter, which is weighted at its outer end, to facilitate the operation of reversing by its own momentum.

In order to prevent the disk h from turning after adjustment, weighted catches t t, hung to the casing L, are adapted to notches t^1, cut in the edge of the said disk.

These catches are thrown out of the notches in the disk, when the latter is to be turned, by a cam-like enlargement, t^2, at the inner end of the shifter, in a manner which will be readily understood by referring to fig. 10.

As it may not in all cases be desirable to reverse automatically, the pins r and r^1 of the shifter are attached to a sliding bar, r^2, on the latter, so that the pin r may be raised out of the notch of the disk k^1, and the pin r^1 out of the slot s^1, into a notch, s^2, of the disk h, (see figs. 13 and 14.)

After such adjustment the shifter may be turned by hand between the shoulders u and u^1 of the casing L, in order to reverse at the times required.

In thus operating by hand, however, the catches t t must be drawn out of the notches of the disk h, and be prevented from again entering the same by means of arms t^3, with which each of the said catches are provided, (see fig. 11.)

Under other circumstances it may be necessary to maintain one or other of the pinions g or g^1 constantly in gear, or to throw both of them out of gear. This may be accomplished by adjusting the pin r of the shifter into one of the notches v, v^1, or v^2 of the casing L, while the opposite pin r^1 remains in the notch s^2 of the disk h, (see figs. 13 and 14.)

The power by which the machine is driven, both for the driving-pulley G and spindle of the head-stock, is derived from a single line-shaft, M, which has its

bearings in a hanger, P, secured to the rafters or suitable frame-work above the machine, (see sheets 4 and 5.)

As the driving-pulley G of the machine has no traveling motion, it is driven directly by a belt extending downward from a cone-pulley, R, on the shaft M.

In order, however, to accommodate the cone-pulley I^1 of the head-stock in its various movements, I have devised a movable carriage, S, adapted to the hanger, and carrying a cone-pulley, I^2, which will always follow and be directly above the pulley of the head-stock.

This carriage has grooved wheels *w*, which run upon ways w^1 of the hanger, and the cone-pulley is arranged to travel transversely across the carriage, upon the squared counter-shaft I^3, to which it is hung, the pulley being provided with small anti-friction wheels *x*, to render its movement upon the shaft as free as possible.

From one side of the carriage projects an arm, S^1, which embraces a sleeve, T, on the squared portion of the shaft M, this sleeve being provided with anti-friction wheels x^1 in the same manner as the cone-pulley, in order that it may slide easily upon the shaft, the motion of which is communicated through the carriage S to the counter-shaft I^3, by means of bevel-wheels, or, as I prefer, by means of the friction-gear illustrated in fig. 18, sheet 5, of the drawing.

This consists of a conical wheel, U, secured to the sleeve, and having a number of annular projections and recesses adapted to corresponding recesses and projections *y* in a conical wheel, U^1, secured to the counter-shaft I^3.

The projections and recesses *x* and *y* of these friction-wheels are double-wedge shaped, so as to be in close frictional contact upon both sides, and thus insure a perfect running of each wheel without dragging or slipping.

The friction can be increased or diminished at pleasure by means of a nut, Z, at one end of the counter-shaft I^3, which so acts upon a spiral spring, Z^1, as to move the said shaft longitudinally, and thus force the wedge-shaped projections of the wheel U^1 into the recesses of the wheel U, or slightly withdraw them from the same, as may be desired.

By means of the above-described mechanism the greatest variety of work can be performed, such as horizontal boring or drilling, turning, planing, key-seat cutting, gear-cutting, and slotting. The latter operation, especially, can be so conducted as to cut either a vertical, horizontal, diagonal, or angular slot.

In order to illustrate the operation of the machine, let it be supposed that a block of metal suitably secured upon the table B is to be planed, such operation to be performed by a revolving tool similar to that for which Letters Patent were granted to me on the 11th day of October, A. D. 1870, and shown by dotted lines in fig. 1.

The tool is first screwed into the spindle of the head-stock, and the latter and the table B are properly adjusted before commencing the work.

The arm F^1 is also lowered so that the table B may not be automatically raised or lowered. As this will not be necessary in the present instance, the nut e^1 is tightened, the nut p^2 at the end of the shaft G^1 is loosened, and the latter is secured by the catch o^1, so as to prevent it from turning, after which the stops *p* and p^1 are properly adjusted and the machine is set in motion.

The head-stock carrying the planing tool No. 4 will first be carried in one direction until it strikes one of the stops of the shaft G^1, which, as before explained, will have the effect of reversing the motion, and the head-stock will then be moved in the opposite direction.

The table is then raised or lowered, as required, in order to present another portion of the surface of the block to the action of the tool, the latter moving backward and forward as the motion of the head-stock is reversed, until the entire surface has been planed.

For horizontal drilling it will be only necessary to move the head-stock H on the side H^1 forward, either automatically or by hand, toward the object secured upon the table.

When the head-stock is to be moved automatically, however, the nut p^2 must be tightened, in order that the shaft G^1 may be rotated by the tubular driving-shaft.

In slotting, a revolving tool is used, and the table B, or the head-stock, or both, will have to be moved, either automatically or by hand, as the slot is vertical, horizontal, diagonal, or angular.

For cutting the teeth of cog-wheels a revolving tool is used also, and the wheel is secured in a horizontal position upon the table, to which a vertical reciprocating motion is imparted. The wheel thus placed upon the table should be secured to and be controlled by appropriate mechanism for determining the number of teeth and the proper distances between the same.

I have devised an arrangement for this purpose which forms the subject of a separate application for a patent.

The machine can also be used for cutting key-seats in pulleys without removing the latter from the position in which they are secured upon the table in order to be turned out inside.

For this purpose a special tool is required, which, as it also forms the subject of a separate application for a patent, will require no description here.

Claims.

1. The sliding head-stock H, its spindle I, and pulley I^1, in combination with the traversing slide H^1, the counter-shaft I^3 moving laterally with the slide H^1, and the driving-pulley I^2 sliding on said counter-shaft.

2. The traversing-slide H^1, head-stock H, and screw J, in combination with the shaft G^1, and worm m^1, and with the worm-wheel *m*, screw J, clutch m^2, and screw-rod n^3, substantially as described.

3. The vertically-adjustable sliding table B, and the nut a^2, vertical screw D, gears *b* b^1, and shaft D^1, in combination with the driving-pinion *i*, adjustable disk *h* carrying the pinions *g* g^1, and gear-wheels b^3, *f*, and e^1, and pinions *f*, *e*, and *e*, substantially as described.

4. The shaft G^1, capable of a limited longitudinal movement, in combination with a sleeve, K, carrying a notched disk, K^1, and having a spiral slot, into which projects a pin on the shaft G^1, with a disk, *h*, having a slot, s^1, and carrying independent pinions *g* g^1, and with an arm, L^1, carrying a slide on which are two pins, one adapted to a notch in the disk K^1, and the other to the slot s^1, so that the longitudinal movement of the shaft G^1 is made the means of turning the disk *h* and moving one of the pinions *g* g^1 into gear with the wheel *f*.

5. The combination of the aforesaid arm L^1 having cam-like projections t^2 t^2 at its lower end, the said notched disk *h* carrying pinions *g* g^1, and pawl-catches *t t* adapted to the notches in the disk *h*, and operated by the cam end of the arm L^1, for the purpose described.

6. The combination of the subject-matter of the preceding claim, and the adjustable projections t^3 on the parts *t t*, for the purpose described.

7. The frame S, having wheels *r* running on

ways w^1, and carrying a rotating counter-shaft, I^3, on which slides a pulley, I^2, in combination with the driving-shaft M and gears V V^1, or equivalent devices, for imparting a rotary motion to the counter-shaft, and with a shaft, I, rotating in a stock which travels horizontally in two directions at right angles to each other, substantially as set forth.

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

C. VAN HAAGEN.

Witnesses:
WM. A. STEEL,
HARRY SMITH.