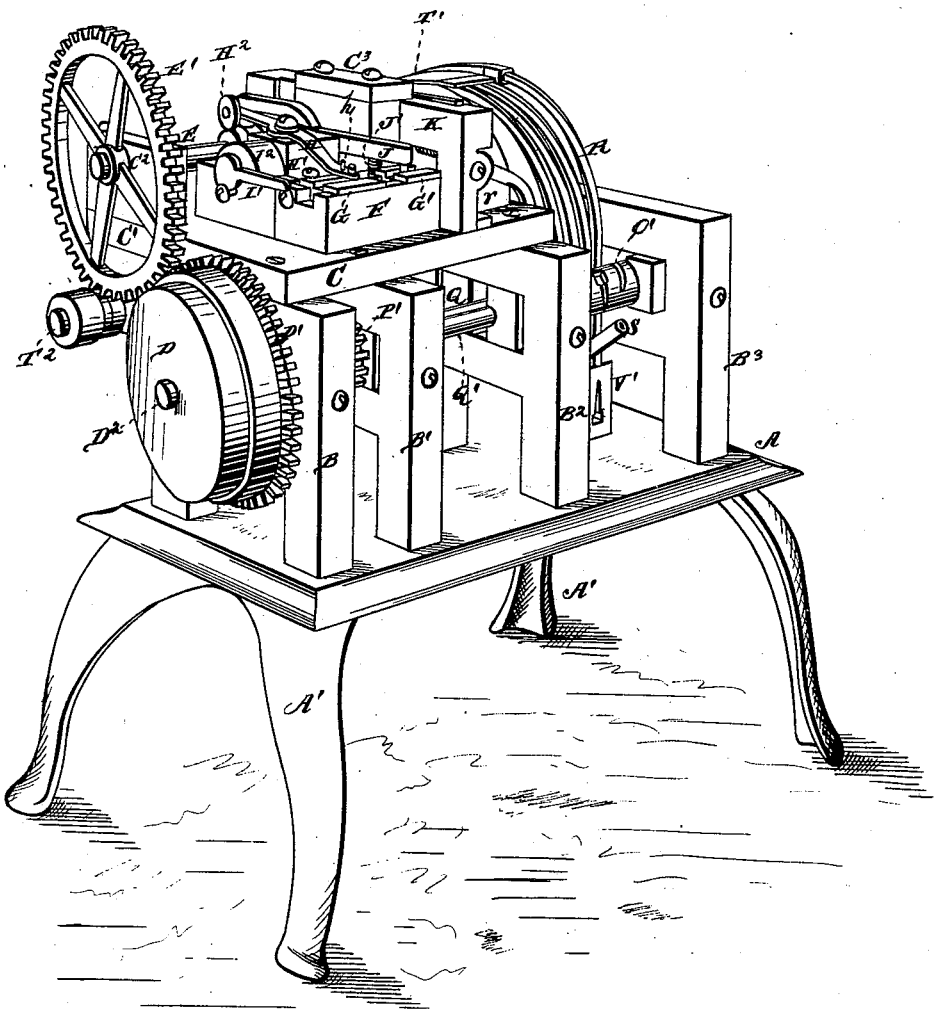
4 Sheets—Sheet 1.

G. J. CAPEWELL.

Machine for Reducing Bars of Metal.

No. 215,719. **Patented May 27, 1879.**

Fig. 1.



WITNESSES

Robt Ewell
Wm Beale Hale

INVENTOR

George J Capewell
by H H Babcock
ATTORNEYS

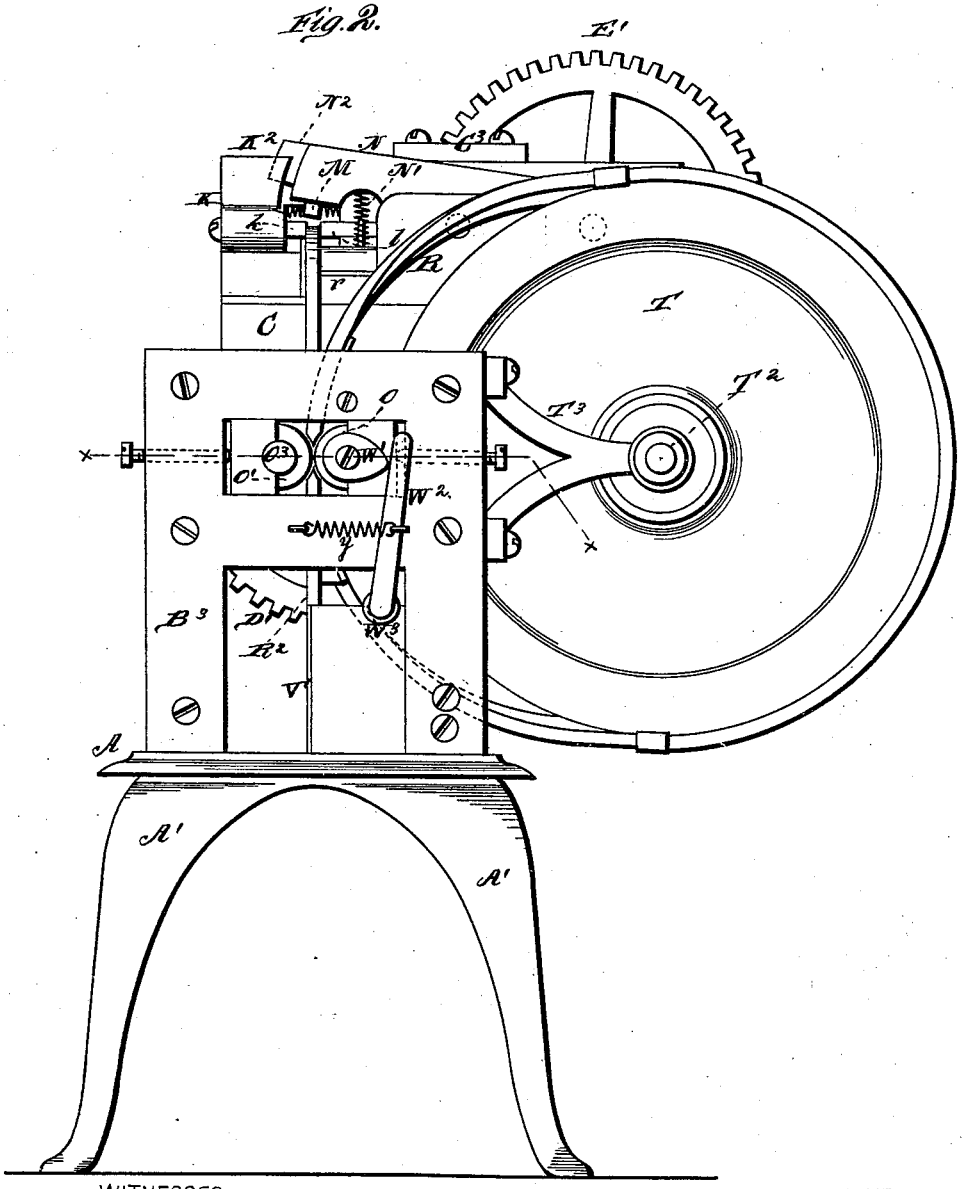
4 Sheets—Sheet 2.

G. J. CAPEWELL.

Machine for Reducing Bars of Metal.

No. 215,719. **Patented May 27, 1879.**

Fig. 2.



WITNESSES

Robt Everett

Wm Beale Hale.

INVENTOR

George J. Capewell

by

Wm H. Babcock

ATTORNEYS

4 Sheets—Sheet 3.

G. J. CAPEWELL.

Machine for Reducing Bars of Metal.

No. 215,719. Patented May 27, 1879.

Fig. 3.

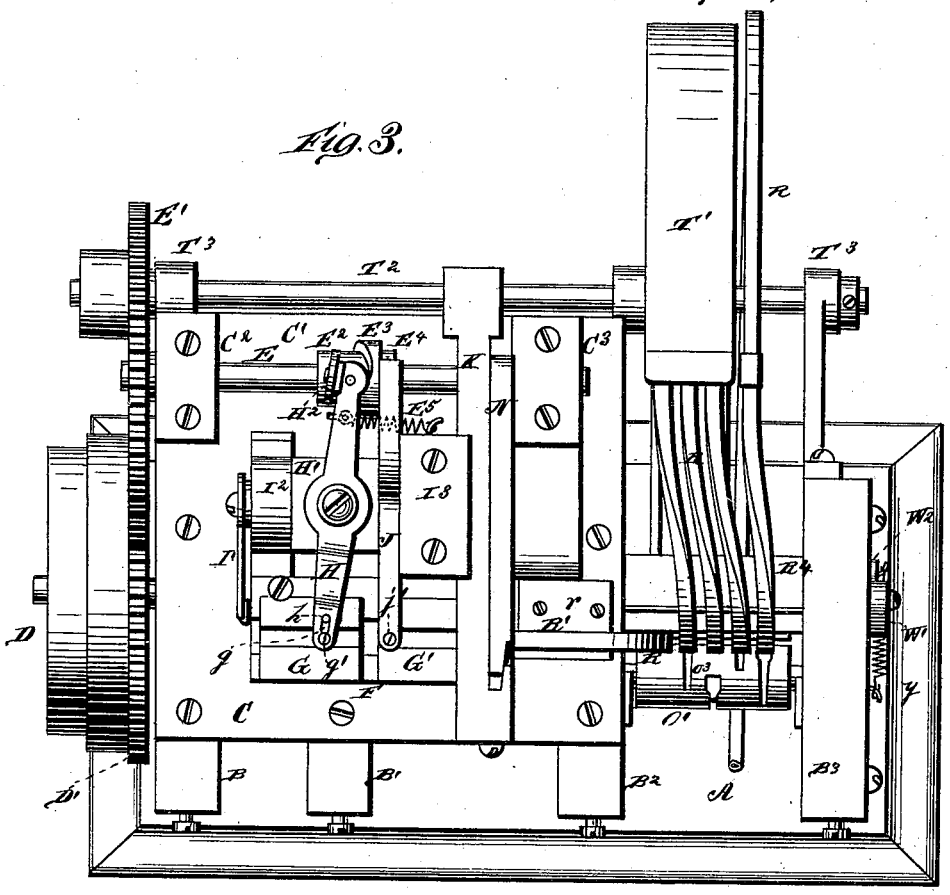
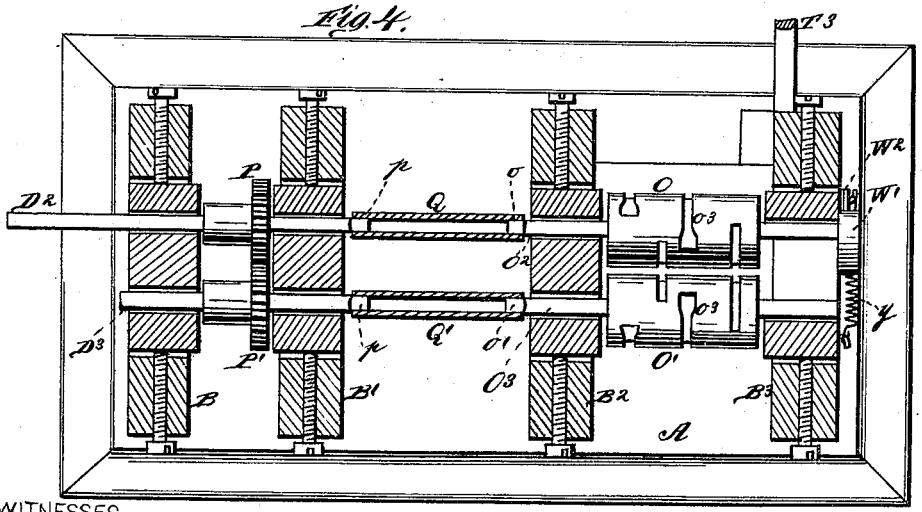


Fig. 4.



WITNESSES

Robert Everett

Wm Beale Hale.

INVENTOR

George J Capewell

by W. H. Babcock

ATTORNEYS

4 Sheets—Sheet 4.

G. J. CAPEWELL.

Machine for Reducing Bars of Metal.

No. 215,719. **Patented May 27, 1879.**

Fig. 5.

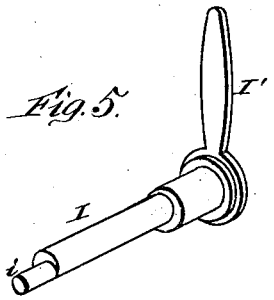


Fig. 6.

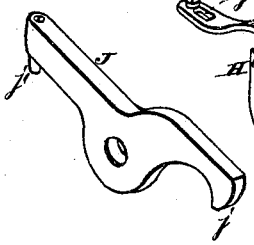


Fig. 7.

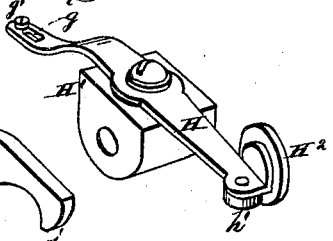


Fig. 15.

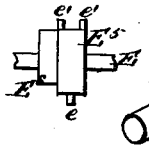


Fig. 8.

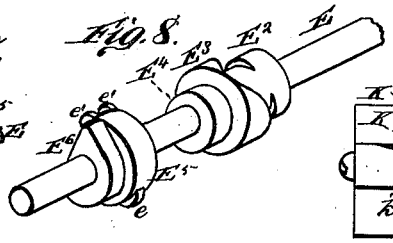


Fig. 9.

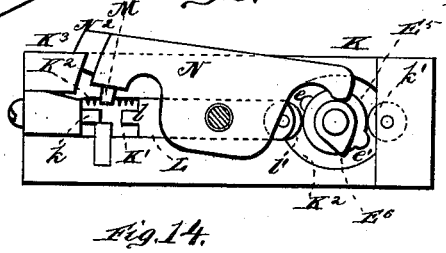


Fig. 10.

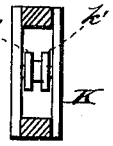


Fig. 11

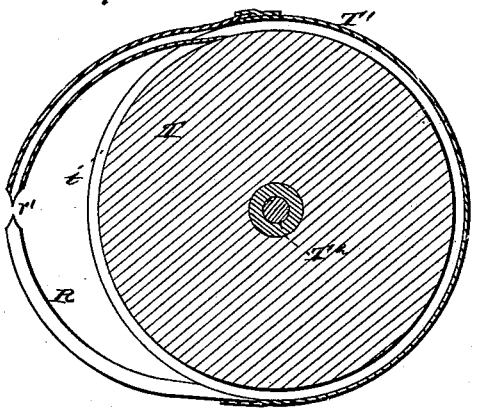


Fig. 14.

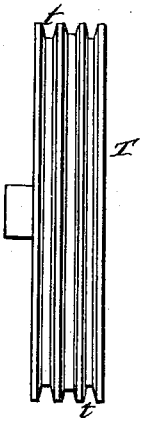


Fig. 16.

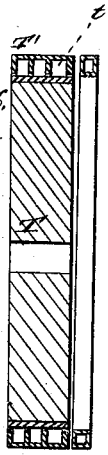


Fig. 13.

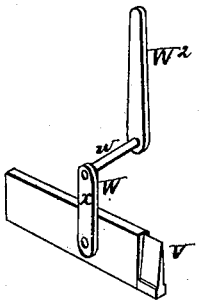
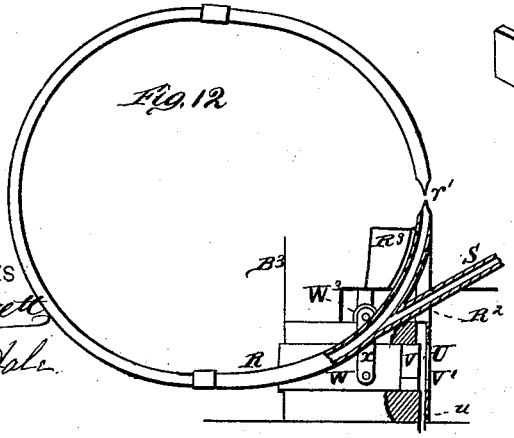


Fig. 12



WITNESSES

Robert Ewer

Wm Beale Hale

INVENTOR

George J. Capewell

by

W. A. Babcock

ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE J. CAPEWELL, OF CHESHIRE, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR REDUCING BARS OF METAL.

Specification forming part of Letters Patent No. **215,719**, dated May 27, 1879; application filed March 25, 1878.

To all whom it may concern:

Be it known that I, GEORGE J. CAPEWELL, of Cheshire, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Machines for Reducing Bars of Metal; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to machines for reducing and shaping bars of metal, and it has more particular relation to that class of machines in which such bars are compressed between grooved pressure-rolls.

The nature of said invention consists, first, in certain improvements in the feeding devices which supply bars to the remainder of the machine; secondly, in certain devices for impressing or shaping the bars before they pass to the rolls; thirdly, in the peculiar construction and arrangement of the guides which present the bars to said pressure-rolls; fourthly, in mechanism for propelling or feeding the bars through said guides; fifthly, in the peculiar arrangement of the die with respect to the discharge end of said guiding apparatus; and, finally, in the peculiar construction and arrangement of various parts of my machine and the several combinations comprised therein.

It is not necessary to be more explicit at this point, for the reason that all of the said parts will be hereinafter particularly described, and the new features clearly pointed out in my appended claims.

In the accompanying drawings, Figure 1 represents a perspective view of my improved machine for reducing bars of metal. Fig. 2 represents an end elevation of the same on a larger scale. Fig. 3 represents a top or plan view of the same. Fig. 4 represents a horizontal section through the line *x x* of Fig. 2. Figs. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 are detail views, hereinafter more particularly referred to.

In said drawings, A designates the bed-plate of the machine, which is supported by legs A′, and forms a base for solid frames B B^1 B^2 B^3, which sustain the operating parts of the machine. C designates a horizontal platform, resting on frames B B^1 B^2, and extending on one side beyond the same at C^1. This overhanging part C^1 supports bearings C^2 C^3.

D designates the driving-wheel of the machine, which receives motion, through belt or other gearing, from any suitable motor. Said driving-wheel is provided with a rigidly-attached gear-wheel, D^1, which meshes with a similar cog-wheel, E^1, on a shaft, E, journaled in said bearings C^2 C^3. Said shaft E (shown in detail in Fig. 8) is provided with cams E^2, E^3, and E^4 for operating the feeding-lever and holding-lever hereinafter described, also with cams E^5 and E^6 for operating the impressing slides and cutter hereinafter described.

On said platform C, near the side opposite to said extension C^1, I arrange, as shown in Figs. 1 and 3, a longitudinal guideway, F, in which a sliding carriage, G, moves forward and backward, conveying successive lengths of metal to a fixed guide-plate, G′, supported by the block which forms guideway F. The reciprocatory movement of said carriage is effected by means of a feeding-lever, H, which is shown in detail in Fig. 7. Said feeding-lever is pivoted so as to have horizontal vibration on the top of a block, H^1, and said block is sleeved upon a short shaft, I, (shown in Fig. 5,) so that it can turn upon the same. Said feeding-lever thus is adapted to have compound motion both vertical and horizontal. Still further to facilitate this, the connection between said feeding-lever H and said feed-carriage G is made by means of a pin, *h*, and slot *g*, whereby said lever is allowed to rock freely in a vertical direction, but carries said carriage with it when it moves horizontally. The same end of said feeding-lever is also screw-tapped to receive a small pressure-screw, *g′*, the office of which is to press on the bar of metal while the carriage is moving forward, and hold the said bar in its place.

The degree of said pressure may be varied to suit the thickness of the bar or other considerations by working the screw out or in through the screw-tapped end of said feeding-

lever. The latter derives its vertical motion from vertically-acting cam E^2 on shaft E, which operates against vertical anti-friction roller H^2 on the other end of feeding-lever H, and its horizontal motion is in like manner derived from horizontally-acting cam E^3, which works against horizontal anti-friction roller h', similarly attached to said lever. The employment of these rollers prevents wear on the cams and the lever, and this application of roller H^2, in particular, is believed to be both new and especially valuable.

The arrangement of said doubly-pivoted feeding-lever, anti-friction rollers, cams, and feed-carriage is such that when the machine is in operation the pressure of said lever on the bar in said carriage continues until said carriage has reached its forward limit, when cam E^2 ceases to operate, and (the roller end of said lever being the heavier) gravity entirely removes the pressure. Said feeding-lever is at the same time relieved from the horizontal pressure of cam E^3, and a retracting-spring, E^5, reverses its horizontal motion, so as to throw feed-carriage G into its rearmost position. As soon as said feed-carriage begins to move forward again the pressure of said feeding-lever on said bar recommences.

It is desirable to prevent the bar from receding with said feeding carriage. To effect this I employ a vertically-acting holding-lever, J, (shown in detail in Fig. 6,) which turns freely on shaft I. This holding-lever is provided with a curved tail, *j*, which receives the upward pressure of cam E^4, and is held against said cam by an expanding spring, J′, so as to cause screw *j′*, in its holding end, to press against the block in guide-plate G′. Said screw *j′* may be adjusted like similar screw *g′*, so as to conform to the thickness of the bar, and for other purposes.

The arrangement of said parts is such that the pressure of said holding-lever is withdrawn from said bar as soon as the forward movement of the feeding-carriage G begins again. The continuous bar is thus fed forward in equal lengths to the cutter, hereinafter described, and to the tubular guide, which conducts the severed lengths to the rollers.

It is often desirable to raise said feeding-lever and holding-lever entirely out of the way of the metal bar, so as to allow the inspection or adjustment of the same, and, for convenience' sake, this should be effected by a single motion. The means shown for accomplishing this result consist of a crank-arm, I^1, and a shaft, I, which shaft is journaled in bearings I^2 I^3 on platform C. The journaling of the inner end of said shaft is effected by a wrist-pin, *i*, which is arranged eccentrically with respect to the axis of said shaft. The result of this arrangement is, that when crank-arm I^1 is raised shaft I is turned eccentrically, so as to raise levers H and J, said crank-arm and shaft being rigidly connected to each other. When said crank-arm is lowered said levers are lowered also.

I do not, however, desire to confine myself to this particular contrivance for lifting said levers, as my invention has a much wider scope.

It is obvious that a shaft like I may readily be carried up and down by a nut traveling on a screw-threaded rod, or by toggle-levers, wedges, or any one of many other well-known lifting devices; but it is also plain that the mechanism herein shown and described as applicable to this purpose is superior to any of the substitute devices immediately above enumerated.

K designates a sliding yoke-frame, which moves at right angles to guideway F and the shafts of the machine between suitable guides on the top of platform C. The metal bars are fed through one end of an elongated recess or broad slot, K^1, in said frame, and said frame is provided at one end of said slot with an inwardly-facing die, *k*. Immediately opposite to said die is a similar die, *l*, formed on the end of a plunger, L, which plunger works longitudinally in said slot or recess K^1. The other end of said slot is enlarged at K^2, to allow cam E^5, Figs. 8 and 15, to turn therein. Said cam is provided at one point of its circumference with a single projection or horn, *e*, which bears against an anti-friction roller, *l′*, on the rear end of plunger L. Said cam is provided on the opposite part of its periphery with two projections or horns, *e′ e′*, which bear against rollers *k′ k′*, which may be made in one piece, arranged opposite to *l′* on the inner face of the yoke-frame K, as shown in Fig. 10. Projection *e* is in the middle line of said periphery, and projections *e′ e′* are on each side of said line, so that projection *e* in turning passes between rollers *k′ k′* without operating them, and projections *e′ e′* pass on each side of roller *l′* without operating it. The effect of said arrangement is that the said yoke-frame and plunger are actuated once only in each revolution of said cam, so that the action of impressing-dies *k l* may alternate with that of the cutter hereinafter described.

An expanding spring, K^2, operates to restore said yoke-frame and plunger to their original positions as soon as the said cam E^5 ceases to act. The action of the cam E^5 is equal in opposite directions, and the elastic strain of said replacing-spring is equally and simultaneously applied at opposite points of the periphery. This prevents any uneven wear or torsion of the bearings of shaft E, which would be inevitable if the cam acted alternately on the sash or yoke-frame K and the plunger L, or on one of them only.

By means of dies *k l* impressions are made in the sides of the metallic bars before being cut off by the cutter M.

This cutter is carried by a vertically-vibrating cutter-bar, N, which is arranged parallel to yoke-frame K, and pivoted near its center to rear bearing, C^3. It is operated by cam E^6, so as to alternate with the action of dies *k l*, and its cutting end is lifted when cam E^6 does

not operate by an expansion-spring, N^1. The cutting end of bar N is also provided with a thinner extension, N^2, which works in a recess of block K^3, attached to yoke-frame K. Said block braces said cutter-bar. The arrangement of the aforesaid devices is such that shortly after each length of bar is cut off by cutter M the dies *k l* close upon and imprint the next length, which is in like manner forced forward to be cut off in its turn. Fig. 9 shows in detail said yoke-frame, plunger, dies, cams, cutter-bar, and cutter. Fig. 4 clearly shows the construction of the rolls O O^1 and the parts of the machine which immediately operate the same. They are driven as follows: Driving-wheel D is provided with a shaft, D^2, which carries a cog-wheel, P, and has a prismatic inner end, *p*. Roll O has a similar shaft or axis, O^2, having a prismatic inner end, *o*. Said ends *o* and *p* are connected by a tubular coupling, Q. A shaft, D^3, is arranged parallel to D^2, and carries a cog-wheel, P^1, which

as to receive the bars or blanks as they are successively cut off and fed forward by the devices hereinbefore described. Tubular guide R is twisted so as to partly turn said bars or blanks in their passage through the rolls, so that pressure may be exerted equally in succession on all parts of them, and their general shape thereby retained. Said guide is wound around between said rolls, so that each of its circles or rings would be compressed thereby, but for the fact that each of said rings is cut away at this point, so as to leave a break or opening, *r'*, as shown in Figs. 11 and 12. These openings are made to register with the grooves of the pressure-rolls, so that the bars or blanks in passing between said rolls are fully exposed to their pressure as they cross said openings. Said guide R is supported by cross-blocks R^3 and R^4, extending from frame B^2 to B^3. Any other suitable supporting devices may be substituted, but the said guide

In the drawings, the guides, grooves, &c., are shown as adapted to one form of angular bar. They may, however, be modified, without invention, to suit any form of bar, whether angular or curved in cross-section. When the plate T^1 is used, as also when it is not used, it is unnecessary to remove the last coil of guide-tube R, the impetus already given by the wheel T or the force of the air-blast being sufficient to carry it through this final coil.

The friction of the wheel T carries the bars or blanks around with it under casing T^1, and when the guide-tubes R conduct said bars or blanks away from said wheel the force derived therefrom propels the said bars or blanks through said tubes. In case of any delay or stoppage the bars or blanks behind would force forward the hindered bar. The action at the delivery end of the guide-tube is the same. It is not necessary nor always desirable that there should be an additional coil. The bars or blanks may pass almost directly downward from the wheel. When the said wheel is not grooved its periphery is preferably provided, as shown in Fig. 16, with a covering of rubber, felt, cloth, or other material suitable for increasing friction.

The discharge end R^2 of said guide R is made vertical, and discharges each blank or bar in succession into die-bed U, which is arranged vertically with an opening, *u*, at the bottom for the escape of scraps of metal below horizontally-operating dies V V′. Female cutting-die V′ is stationary; but male cutting-die V is carried by a plunger, W, reciprocating at right angles to the cutting-rolls, Figs. 12 and 13. This plunger is operated by a cam, W^1, on shaft O^2, already described, which cam works against an upright lever, W^2, pivoted at its lower end on the end of shaft *w*, which turns in a fixed sleeve, w^3. The inner end of said shaft *w* is connected by a vertical link-bar, *x*, to plunger W. Lever W^2 is retracted by a spring, *y*, when the pressure of cam W^1 is removed, so as to withdraw die V from die V′. The construction of said dies may be varied without departing from the spirit of my invention.

It is often convenient to use a series of rolls instead of two only, as shown in the drawings, smaller rolls being better suited to pointing and other light work than the large rolls which are necessarily used in reducing.

In the drawings the dies are shown as especially adapted to the manufacture of horse-shoe-nails; but the machine may be used for manufacturing many other articles also. The rolls may be arranged either vertically or horizontally, the other parts being correspondingly changed in position; but I prefer the arrangement shown.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a metal-working machine, the combination, with a feeding-lever and a holding-lever, of a lifting device for raising said levers out of engagement with the bar or blank of metal operated on.

2. In combination with a feeding-lever and holding-lever, a cam-shaft and lever for raising said levers out of engagement with the bar of metal operated on.

3. In a metal-working machine, the combination of a die-carrying plunger and a die-carrying yoke-frame with an operating-cam, said parts being so arranged that said yoke-frame guides and braces said plunger, and said yoke-frame and plunger apply counterbalancing and simultaneous strain to opposite sides of the operating-shaft.

4. In a metal-working machine, the combination of a rotating cam having a projection on the middle line of its periphery and two opposite projections, one being on each side of said middle line, with a reciprocating die-carrying yoke-frame and plunger having correspondingly-arranged anti-friction rollers and a vertically-acting cutter, the arrangement of said parts being such that said dies and said cutter act alternately, substantially as described.

5. In a metal-working machine, the combination, with pressure-rolls, of a spiral guide and devices for transmitting bars of metal through the same.

6. In a metal-reducing machine, the combination, with pressure-rolls, of a spiral guide adapted to turn the bars in their passage from groove to groove of the rolls and devices for transmitting bars of metal through the same.

7. In a metal-reducing machine, the combination, with pressure-rolls, of a spiral guide-tube, casing, and feeding-wheel, said feeding-wheel and casing forming grooved or channeled connections between the severed parts of said guide-tube, and operating substantially as and for the purpose set forth.

8. In combination with pressure-rolls and a spiral guide-tube, a curved plate or casing and a feeding-wheel grooved on its periphery to correspond with the coils of said guide-tube and connect the severed parts of the same, substantially as set forth.

9. In combination with a continuous guide for supplying the pressure-rolls of a metal-reducing machine, a vertically-arranged die-block having horizontally-operating dies, said guide terminating in a vertical discharge end, substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

GEORGE J. CAPEWELL.

Witnesses:
EDWARD A. CORNWALL,
CORNELIA A. CORNWALL.