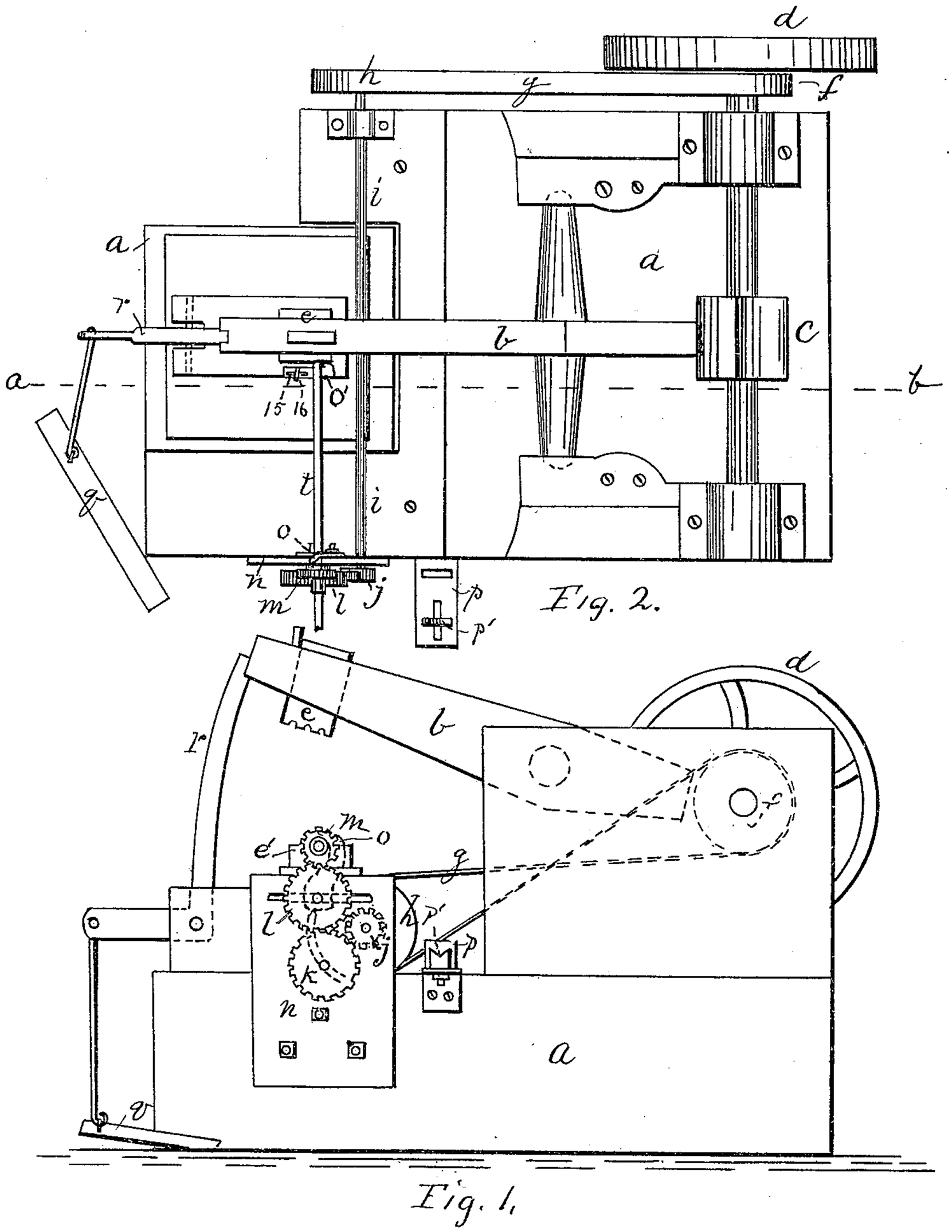
(No Model.)

3 Sheets—Sheet 1.

G. H. HATHORN.

ATTACHMENT FOR TRIP HAMMERS.

No. 354,192. Patented Dec. 14, 1886.



Witnesses

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John B. B. Fiske

Inventor

George H. Hathorn

per Wm. Franklin Leavy Atty

(No Model.) 3 Sheets—Sheet 2.

G. H. HATHORN.

ATTACHMENT FOR TRIP HAMMERS.

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Fig. 9.

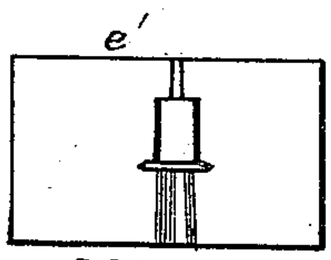

Fig. 6.

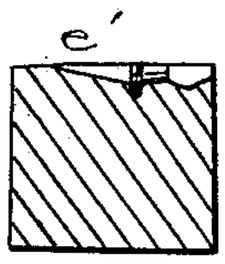

Fig. 7.

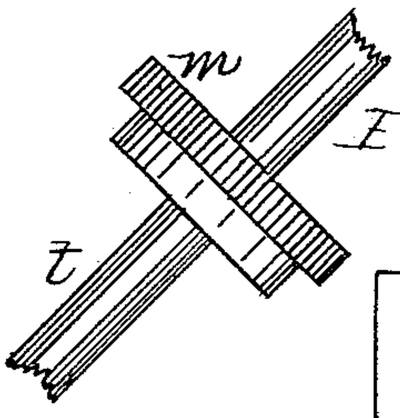

Fig. 8.

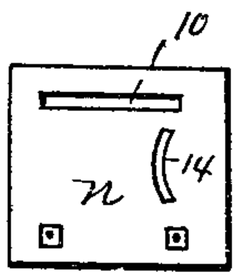

Fig 4

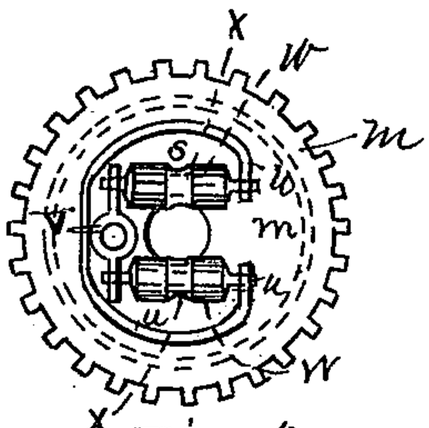

Fig. 5

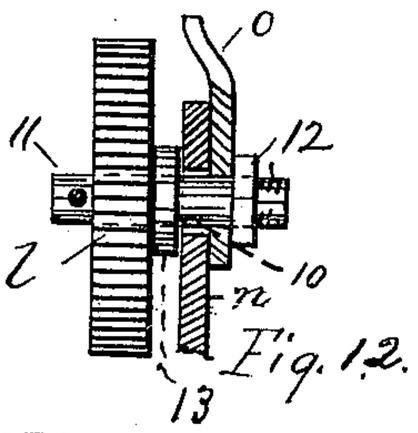

Fig. 12.

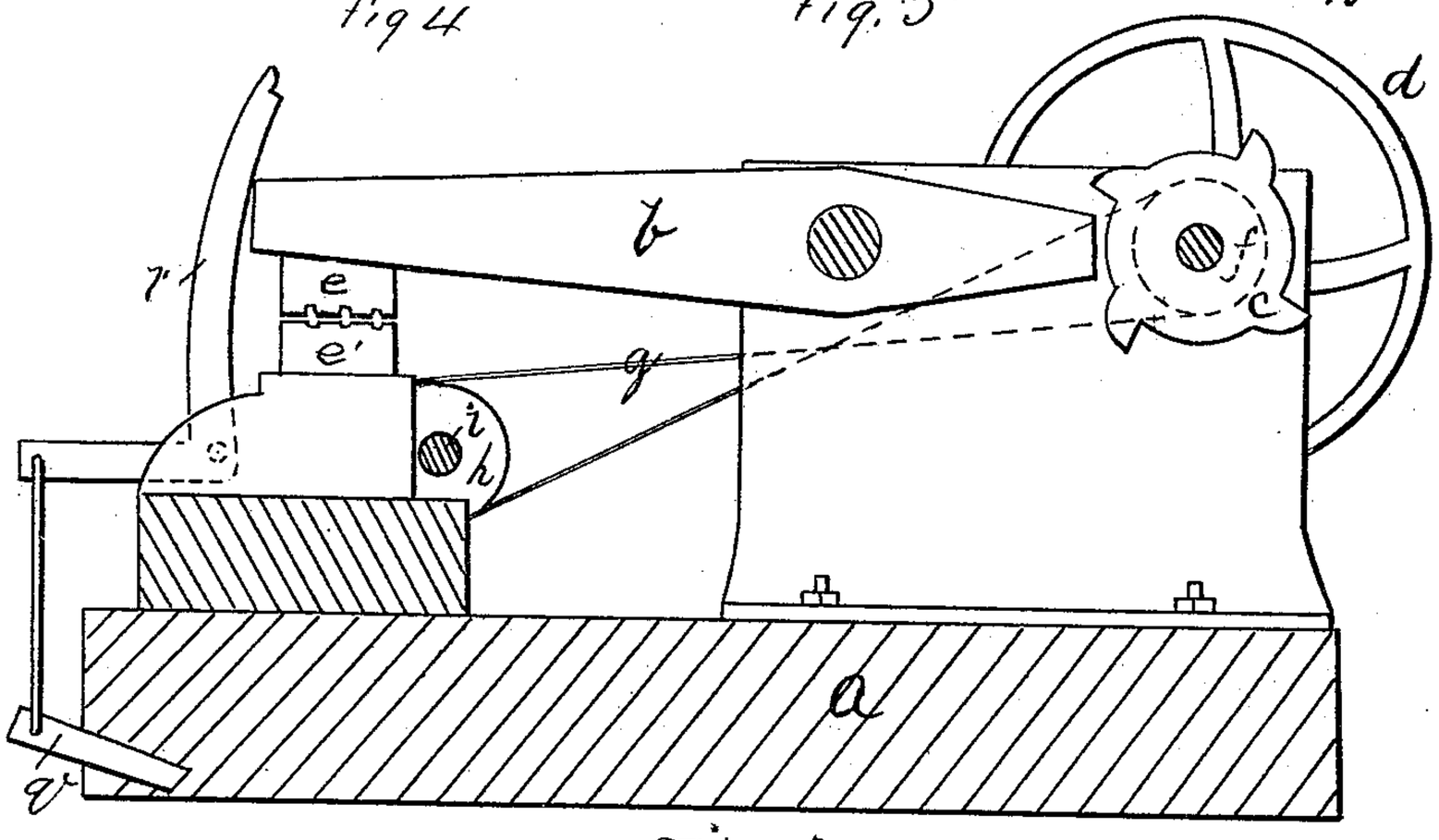

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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ATTACHMENT FOR TRIP HAMMERS.

No. 354,192. Patented Dec. 14, 1886.

Fig. 10

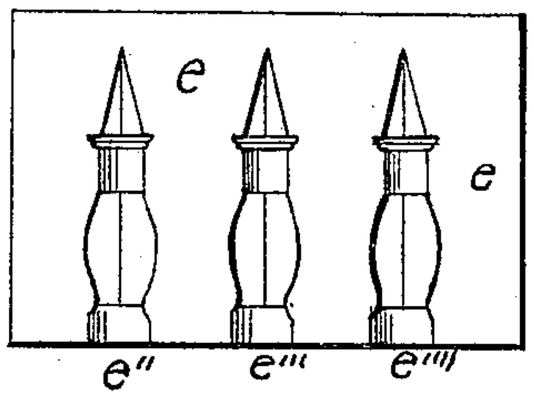
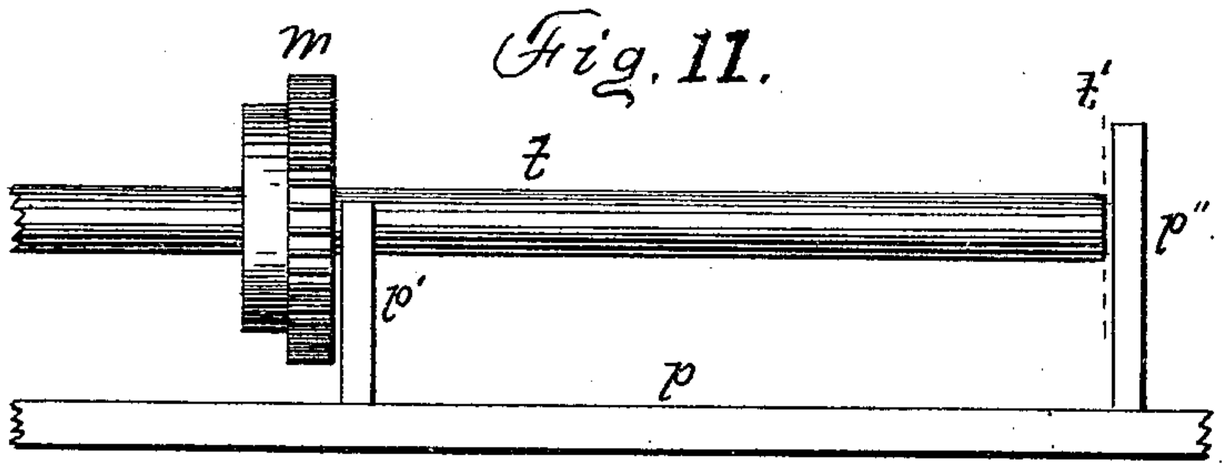


Fig. 11.



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UNITED STATES PATENT OFFICE.

GEORGE H. HATHORN, OF CHESTER, MAINE.

ATTACHMENT FOR TRIP-HAMMERS.

SPECIFICATION forming part of Letters Patent No. 354,192, dated December 14, 1886.

Application filed January 8, 1884. Serial No. 116,751. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HATHORN, of Chester, in the county of Penobscot and State of Maine, have invented certain new and useful Improvements in Attachments for Trip-Hammers; and I do hereby declare that the following is a full, clear, and exact description of the invention, that will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to certain attachments for trip-hammers, enabling round or square articles to be forged with ease and rapidity.

By the devices now in use it requires an expert to run a trip-hammer up to a speed of three hundred blows a minute and make square-cornered work, whereas by the use of my invention with very slight practice a speed of fifteen hundred blows may be attained. This speed not only enables the work to be turned out more rapidly, but by the latent heat evolved by the rapid and forcible blows of the hammer gives a far better result by keeping the metal hot until the work is completed.

My devices are applicable to the manufacture of any article which can be forged from a metal rod or bar, or to any trip-hammer or machine in which it is desirable to give a rotary motion to a rod or bar while in the process of forging. They are particularly useful in the manufacture of driving-calks and similar classes of small articles, and for the purposes of illustration I have shown in the annexed drawings a machine adapted to such work.

In the accompanying drawings, Figure 1 is a side elevation of a trip-hammer with my invention attached. Fig. 2 is a plan of the same. Fig. 3 is a section through line *a b*. Fig. 4 is a detail of plate-supporting gears. Fig. 5 is a detail of clutch-gear. Fig. 6 is face view of die, showing a matrix for one kind of calk. Fig. 7 is section of die, showing matrix for calk, as seen at Fig. 9; Fig. 8, view of clutch-gear as attached to a rod; Fig. 9, completed calk by matrix in Figs. 6 and 7. Fig. 10 is a face view of a die with three similar matrices sunk into it. Fig. 11 is a side view of the gage *p*, with a rod and clutch-gear. Fig. 12 is a side view of the sliding gear *l* and stud 11, showing the nut 12 and the supporting-plate *n* and rest *o* in section.

In the drawings, similar letters and numbers refer to corresponding parts throughout.

a is a foundation. *b* is a helve or handle. *c* is a cat-head or cam. *d* is a driving-pulley. *e e'* are dies, and *e'' e''' e''''* are matrices sunk in the faces of the dies. *f h* are driving-pulleys. *g* is a belt. *i* is a shaft. *j* is a gear on the shaft *i*. *k* is a gear movable on the plate *n*. *l* is a gear sliding in the slot 10. *m* is a clutch-gear on the rod *t*. *n* is a plate having the horizontal slot 10 and curved slot 14. *o* is a rest, and *o'* a rest in close proximity to the dies, and to be used when necessary. *p* is a gage, *p'* a forked rest, and *p''* a standard or stop in the gage *p*. *q* is a foot-lever connected by a rod to the stop *r*. *r* is a jack or stop thrown under the handle *b* when desirable to stop the machine. *s* is a clutch in *m*. *t* is a rod or bar of any ductile metal. *u* is a curved spring. *v* is a cross-bar. *w w* are rollers. *x x* are annular grooves on the rollers. 11 is a stud or pin on which the gear *l* rotates, and which serves also to hold the rest *o* in place. 12 is a nut. 13 is a collar against which the face of the gear bears. *t'* is a dotted line at the point where the completed calk or other article is cut off from the rod and corresponds to the dotted line shown in Fig. 9. 15 is a slot, 16 a nut.

In the accompanying drawings, at Figs. 1 and 2 are shown elevation and plan of an ordinary trip-hammer, but in this case operated by the cat-head or cam *c* and driving-pulley *d*. The dies *e e'* are fitted with corresponding matrices in their faces, and one, *e*, is secured in the helve or handle *b*, the other, *e'*, being inserted in the anvil-block and carefully adjusted, so that at each blow the matrices in the face of each die shall correspond exactly with those in the face of the other. In this case the matrices are intended to form driving-calks, as shown in Figs. 6 and 7, the completed calk having a square point, circular collar, round shank, and flat bulging flanges, as shown at Fig. 9. From pulley *f* on the main shaft a belt, *g*, extends to a pulley, *h*, upon a shaft, *i*, which extends across the machine and carries upon its other end a gear, *j*,

meshing into loose or movable intermediate gears, *k l*, and giving them revolution. The gear *j* receives motion in the machine illustrated to the extent of one-quarter of a revolution for every blow of the hammer, and through the intermediate gears, before mentioned, communicates it to the clutch-gear *m*, which is movable longitudinally on and is passed on over the rod or bar of metal to be forged, forming both a collar and gear when the rod is in position to be acted upon by the hammer. This clutch-gear is put on in such a manner as to be capable of sliding longitudinally on the rod or bar *t*, but so as to grip or clutch it when the motion is rotary. I will hereinafter explain its construction as a matter of illustration, although the details can be varied considerably without affecting the result.

In forging round, six-square, or eight-square articles the relative motion of the gears and hammer may be regulated by increasing or diminishing the number of teeth in the gears, or otherwise communicating a more or less rapid rotation relatively for each stroke of the hammer.

The plate or frame *n*, supporting the gears before mentioned, is provided with a rest, *o*, against which the geared clutch *m*, acting as a collar on the rod or bar *t* to be forged, is held while under the hammer. A gage, *p*, is also fixed in a convenient locality on the machine, and the length of rod necessary to make the calk or other article is determined by setting the rod *t* in the fork *p'* with the clutch-gear bearing against the fork and pushing the rod *t* inward to the stop *p''*, thus sliding the clutch-gear *m* a proper distance on the rod *t* to furnish to the dies the same requisite amount of metal at each presentation. The rod *t* is then heated, the clutch-gear remaining upon it while heating, and placed with the clutch-gear *m* bearing against the rest *o*, thus bringing the gear *m* into mesh with the gear *l*, and allowing the end of the rod to enter between the dies a suitable distance to form the calk or other desired article.

It will readily be seen that the clutch once put onto a rod never leaves it until the rod is used up, and, as is my practice, by having several clutch-gears a number of rods may be alternately heating and being forged at the same time, thus economizing time and labor equal to a large percentage of the cost of manufacturing.

A jack or catch, *r*, is thrown forward under the end of the helve or handle *b* when it is desirable to stop the machine, and to this is connected by a rod the lever or treadle *q*. If it is desired to start the machine, the foot of the operator is pressed upon the lever, throwing the catch *r* out from under the end of the helve, and the machine begins to operate the gears, at the same time communicating a rotary motion to the rod or bar, which is rapidly forged into shape under the dies. If the article to be made tapers toward the point, or if a comparatively large piece of metal is to be worked down, the natural longitudinal movement of the rod will be toward the operator to accommodate the surplus iron, and this would have a tendency to push the gear *m* outwardly and off of the gear *l*, and to allow for this I prefer to make the edge of the gear *l* wide enough to permit the pushing back of the rod or bar without danger of the rod *m* being thrown out of mesh. The forging completed, the calk or other article is cut from the end of the rod in the usual manner, and the operation repeated on another rod already heated and provided with a similar clutch gear. In the meantime the first rod is pushed through the gage *p*, adjusting the clutch at the proper distance for another forging, when the end is again heated and it is ready for the machine. So rapidly does the machine operate that quite a large number of rods, each supplied with a clutch-gear, are constantly kept on the forge heating.

The construction of the clutch *s*, attached to the gear *m*, for the purpose of holding the gear to the rod *t* while rotating, and yet sliding upon the rod *t* longitudinally, is shown in Fig. 5. At *u* is a curved spring having pins securing it to the face of the gear *m* nearest the operator, while at *v* is a cross-bar, also secured to the gear, and between the cross bar and the ends of the spring are secured the rollers *w w*, the tendency being to force the rollers inward or together and to clasp or embrace the rod in the annular grooves *x x*, with which they are provided. A plate or box covers the device, having an outwardly-projecting hub serving to keep the rod in position without interfering with the operation of the clutch-gear. It will be seen that the rollers will allow a free longitudinal movement of the rod through the gear, while the pressure of the spring *u* is sufficient to prevent its rotation in the clutch.

I do not limit myself to this precise device for the clutch, as many substitutes will readily suggest themselves. For instance, in square work an apertured gear provided with a hub and set-screws would be an efficient device.

The intermediate gears, *k l*, are both made adjustable to allow of moving the rod to be forged from one matrix in the face of the dies to another without getting out of mesh. This adjustability is secured as follows: The plate or frame *n* has a horizontal slot, 10, cut therein, through which passes a stud, 11, serving as an arbor for the gear *l*, and provided with a thread and nut, 12, upon its inner face, by which it can be secured in any position in the slot 10 and a collar, 13, against which the face of the gear rests. The rest *o* is also secured to the pin or stud 11 and moves with the gear, though it may be separately attached, if preferred. A second slot, 14, struck upon a curve the center of which is the center of the fixed gear *j*, secures the adjustment of the gear *k*, because, being struck from the center of *j*, the gear *k* cannot get out of mesh with *j* by moving to any part of the slot 14. The gear *k* is

provided with a similar arrangement of pin or stud and nut. Now, as one set of impressions or matrices in the dies *e e'* wears away, it is evident that the gear *l* may be moved from right to left, or vice versa, carrying the rest *o* and guiding the rod into a new matrix in the die, the gear *k* also being set to retain its mesh with the gear *l*, the curved slot in which its arbor moves always insuring its remaining in mesh with the gear *j*. A second rest or guide, *o'*, may be used, if desired, in close proximity to the dies, to steady the end of the rod under the hammer, and this must of course be made adjustable, which I do by means of the slot 15 and nut 16.

Instead of the gears which I now use, friction-gears might possibly be used; but the operations would not be as positive, and it would probably be considered as simply a colorable variation of my invention.

The gage *p*, as shown in Fig. 2, is shortened up and the rod shown broken, as should also the gage have been; but the gage with rod and clutch is shown more fully in Fig. 11, Sheet No. 3 of drawings.

The face of the dies in actual use is not correctly shown in Fig. 6, either in shape of matrix or the number of matrices, and the face of a die as in actual use is shown in Fig. 10, Sheet No. 3 of drawings, showing a multiplicity of matrices corresponding with the calk, Fig. 9, and with Fig. 7.

I am aware that trip-hammers have been in use in which forging has been done while the rod or bar was rotated under the blows of the hammer. I do not therefore claim a trip-hammer as a whole; and I hereby disclaim anything in the English patent cited as a reference in this case, "Isaac Buckley, No. 1,549, dated June 21, 1864, Forging-Machines," my invention relating solely to improvements in attachments for such machines, by the use of which the labor and expense of manufacturing may be greatly reduced and the operations greatly expedited.

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

1. In a trip-hammer, the combination of the hammer, the shaping-dies, a removable holder for the articles to be shaped, means, substantially as described, for engaging with and automatically rotating said holder when the hammer is in operation, and a bearing for the article whereby the holder is maintained in proper relation to the rotating devices, substantially as described.

2. In combination with a shaping trip-hammer, a holder having an opening through which the bars may be fed to the hammer, and a clamp for securing the bar for the articles to be shaped, mechanism, substantially as described, adapted to receive said holder and to rotate it during the operation of the hammer, and a stop which arrests the hammer during the changing of said holders, substantially as described.

3. In a trip hammer, the combination of the hammer, the shaping-dies, a holder for the article to be shaped adapted to rotate it when the hammer is in operation and having a geared periphery, and a driving-gear meshing with said holder, one of said meshing-gears being widened, whereby a limited longitudinal movement of the article being shaped and its holder is permitted, substantially as described.

4. In a trip-hammer, the combination of the hammer, the shaping-dies provided with a series of matrices, a rotating holder for the article to be shaped movable to adjust the article to the matrix being used, and a gear-train which drives said holder and is adjustable to accommodate the position of the holder, substantially as described.

5. In a trip-hammer provided with appropriately-shaped dies, and designed to forge articles of varying shape and size from any ductile-metal rods, rotating more or less rapidly under the blows of the hammer, the sliding separable clutch-gear *m*, designed to slide upon the rod or bar *t* longitudinally and clasp the rod or bar firmly while rotating, imparting a rotary motion to the rod or bar, in combination with sliding gear *l*, adjustable gear *k*, fixed gear *j*, plate or frame *n*, and rest *o*, all acting and operating together to impart a rotary motion to a rod or bar while being forged under the blows of the hammer, all as shown and described.

6. In a trip-hammer designed to forge articles of varying shapes and sizes from rods or bars of any ductile metal rotating under the blows of the hammer, the clutch-gear *m*, provided with the spring *u*, annularly-grooved rollers *w w*, and peripheral gear-teeth, and designed to slide longitudinally on a rod or bar, *t*, and to clutch or grip the rod or bar firmly while rotating, in combination with the rod or bar *t*, and a gear, *l*, however actuated, all designed and acting or operating to impart a rotary motion to the rod or bar *t* while being forged under the blows of a trip-hammer, the clutch-gear being separable from the other parts, all as shown and described.

7. In combination with the trip-hammer, the trebly matrixed dies *e e'*, the actuating shaft *i*, the rod *t*, the clutch-gear *m*, and the rest *o*, with their operating devices, all arranged and operating together, as shown, and as and for the purposes described.

8. In a trip-hammer designed to forge articles from rods or bars of iron or any other ductile metal while the rods or bars are rotated under the blows of the hammer, the separable clutch-gear *m*, provided with the annularly-grooved rollers *w w*, arranged as described, or any equivalent device, operating in connection with the gears *k l* to communicate a rotary motion to the rod *t*, and sliding longitudinally upon the rod *t* in such a manner that it may be taken from the machine with the rod and adjusted upon it by a gage, *p*, to regulate the distance which the rod can extend between

the dies, and also permitting the rod to be heated with the clutch gear in place upon it, all as shown and described.

9. In a trip hammer designed for forging from ductile-metal rods rotating under the blows of the hammer, the dies *e e'*, formed with two or more matrices sunk in their faces in order to allow the hammer to be shifted from a matrix which has become worn to a fresh one, as shown and described, in combination with the movable rest *o*, separable clutch-gear *m*, sliding gear *l*, adjustable gear *k*, actuating-gear *j*, supporting-plate *n*, having the horizontal slot 10 and the curved slot 14, the stud and nut 11 and 12, designed by adjustment to allow of shifting the rod *t* from one matrix to another, and the gage *p*, whereby the clutch is adjusted longitudinally on the rod *t*, all as shown and described, and substantially as and for the purpose hereinbefore set forth.

10. In a trip-hammer designed for forging from any ductile-metal rods while rotating under the blows of the hammer with either plain or matrixed dies, the separable clutch-gear *m*, provided with the clutch *s*, having the annularly-grooved rollers *w w*, and curved spring *u*, and designed to clutch or clasp a rod or bar, *t*, and impart a rotary motion to the rod when the clutch is brought into mesh with either a stationary or adjustable driving-gear, as shown at *l*, however the driving-gear may be actuated, all arranged and operating to impart a rotary motion to the rod *t* while being forged under the blows of the hammer, as shown and described.

11. In a trip-hammer designed to forge from rods or bars of metal while rotating uuder the blows of the hammer, the combination of the separable clutch-gear *m*, having the spring *u*, and grooved rollers *w w*, attached with the gage *p*, provided with the bifurcated rest *p'* and standard or stop *p''*, by means of which the separable clutch-gear is adjusted to the proper distance from the forged end of the rod *t* at each successive operation, all as shown and described.

12. In combination with the hammer *b* and dies, as described, the fixed gear *j*, adjustable gears *k l*, and the plate or frame *n*, supporting said gears and provided with the slots 10 and 14, in which said movable gears are journaled, substantially as shown and described.

13. The combination of the gear *m*, spring *u*, and cross-bar *v*, secured thereto, with the rollers *w w*, provided with the annular grooves *x*, as shown and described, the whole forming a separable clutch-gear adapted and designed to move easily lengthwise on a rod or bar and to clutch or clasp it and impart a rotary motion to it whenever the clutch itself is actuated, as shown and described, and substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 29th day of December, 1883.

GEORGE H. HATHORN.

Witnesses:
ISAAC R. CLARK,
WM. FRANKLIN SEAVEY.