June 3, 1930. F. H. SCHWERIN 1,761,412

PINION PULLER

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Fig. 1.

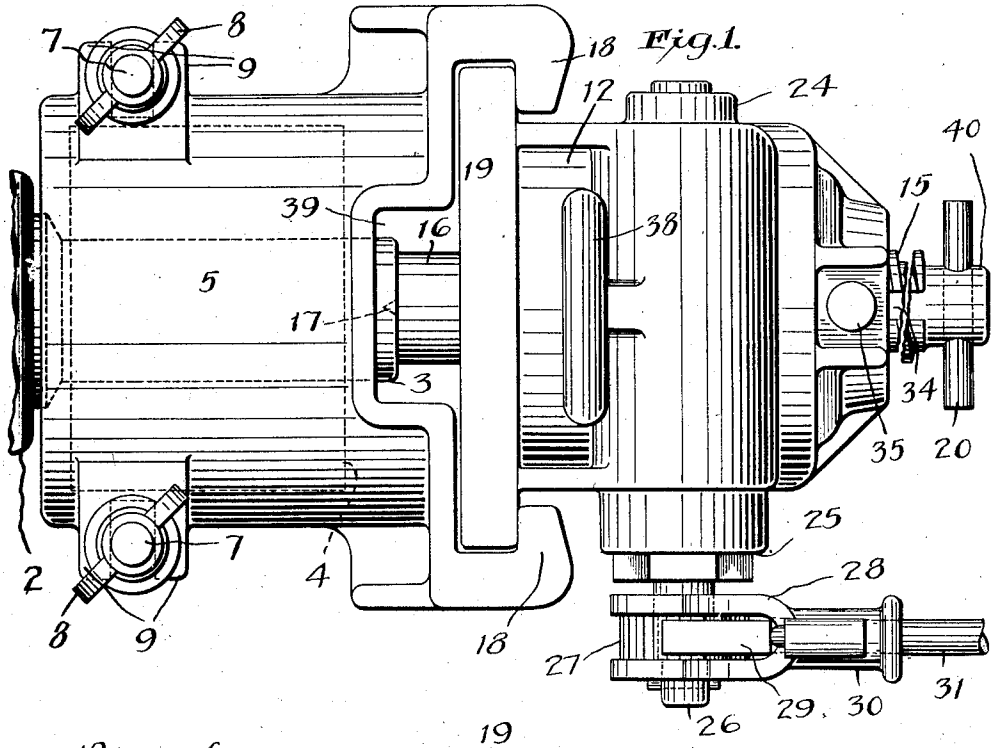
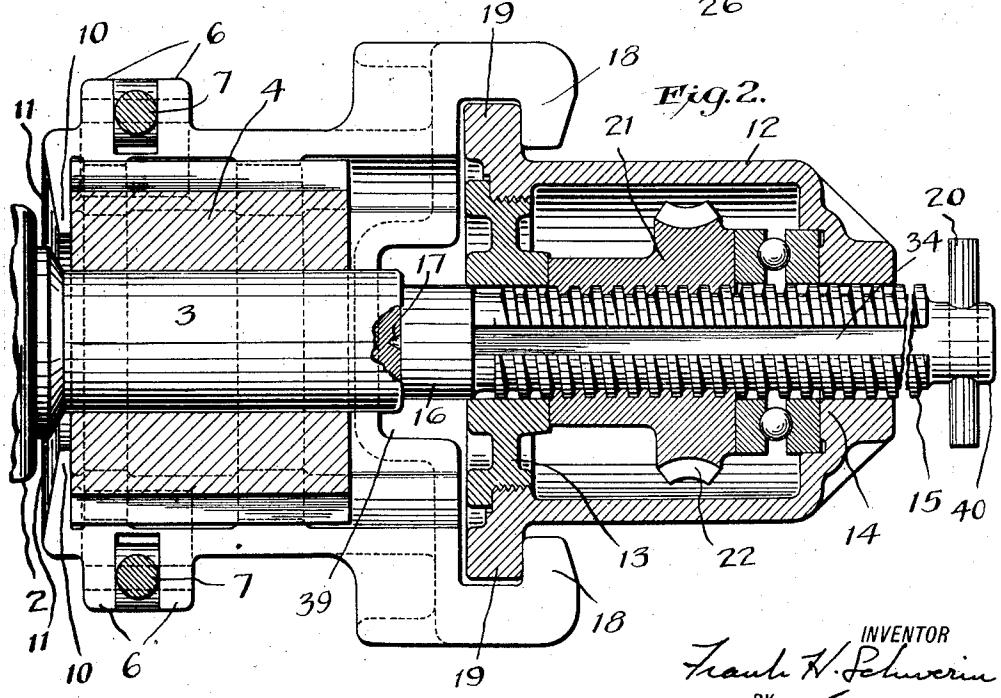


Fig. 2.



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Fig. 3.

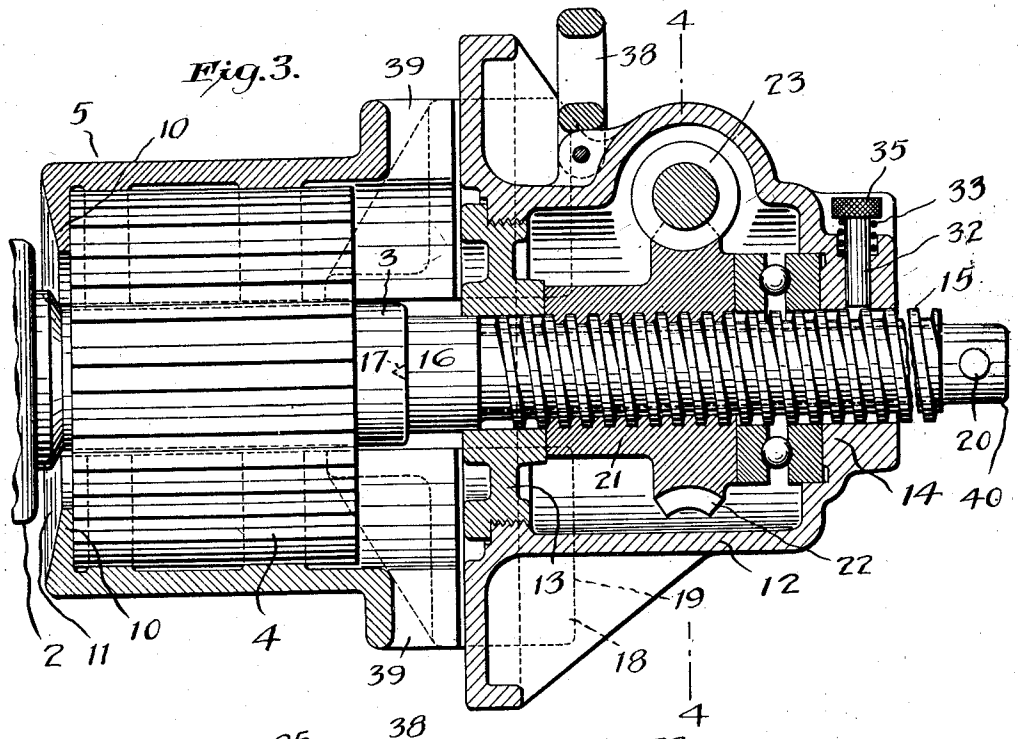
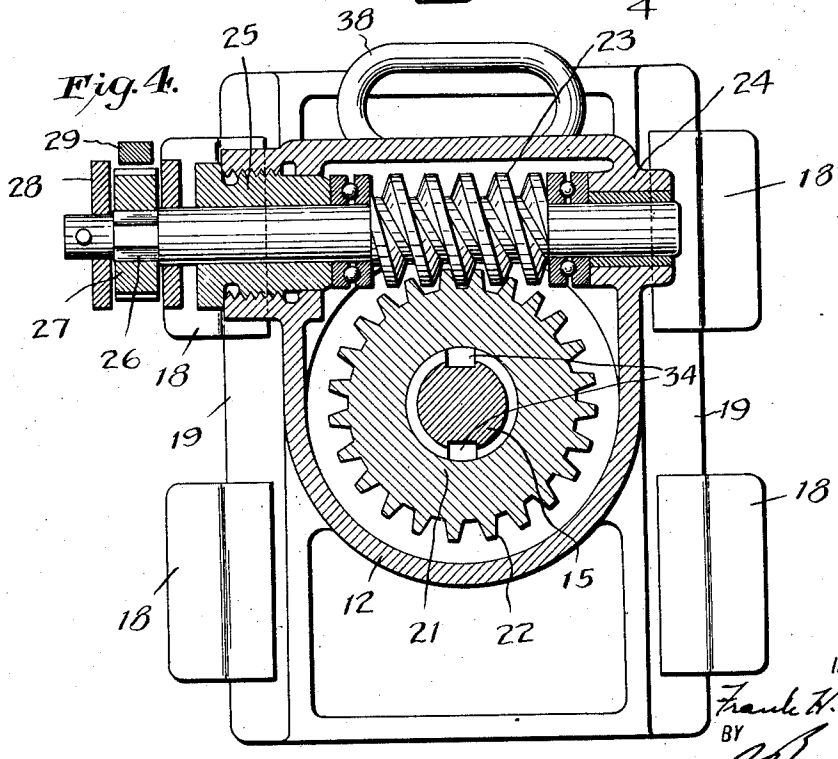


Fig. 4.



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Fig. 5.

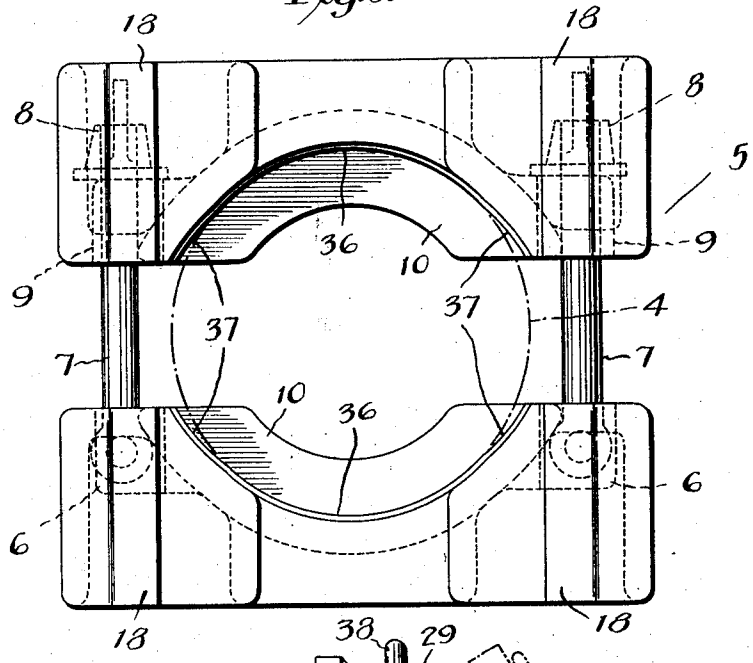
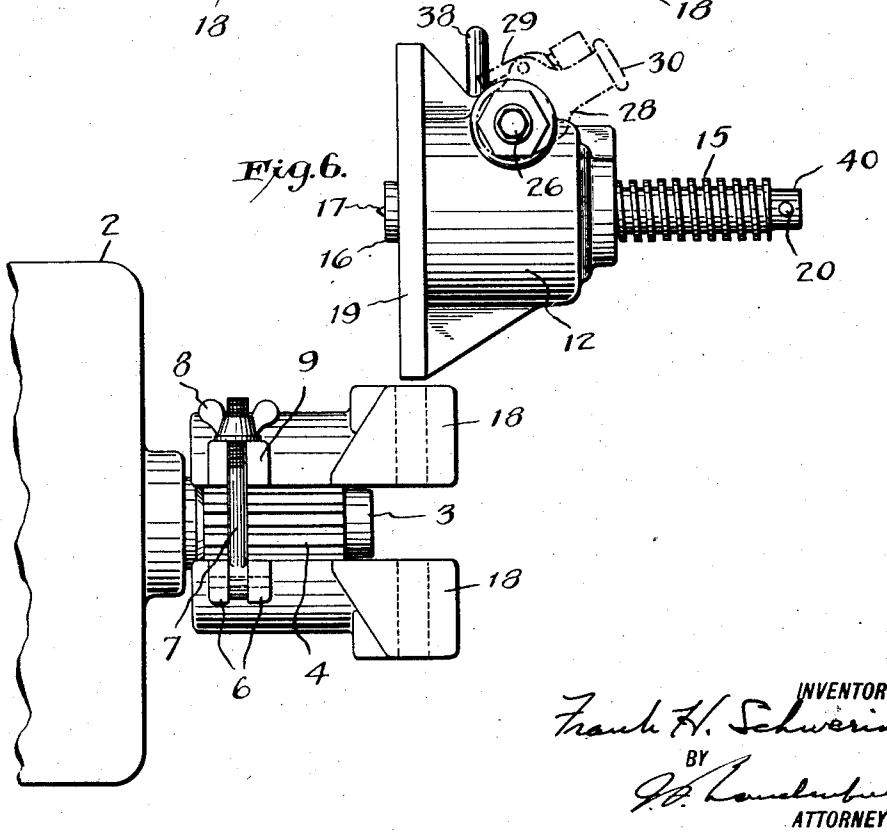


Fig. 6.



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UNITED STATES PATENT OFFICE

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PINION PULLER

Application filed March 23, 1926. Serial No. 96,749.

The invention relates to appliances for forcing parts longitudinally with respect to shafts or axles, and comprises a device more particularly for pulling pinions or the like off shafts. The pinions of electric car motors are very powerfully fastened by key and taper on the projection of the armature shaft, and are very close to the motor housing, so that it is extremely difficult to remove these pinions when the necessity arises, as it not infrequently does. An ordinary method is to drive wedges between the pinion and the motor housing, but this often breaks the housing, which is a great loss. Pulling devices have been provided for this purpose, but they have been open to objections which have kept them from very wide adoption.

The purpose of this invention, generally stated, is to provide a simple, compact, light, powerful, convenient and effective, manual-mechanical device, readily adjustable to numerous different sizes of pinions or collars, in particular a two-part appliance, comprising the jaw part and a power part, with interengaging formations whereby the power part is introduced into pulling engagement with the jaws after the jaws have been fastened on the pinion.

The various features and combinations of the invention will become apparent as the specification proceeds, and will be more particularly set forth in the claims.

In the accompanying drawings, forming part hereof:

Fig. 1 is a plan view of the device on the pinion and shaft of an electric motor, a portion of the motor housing being shown;

Fig. 2 is a horizontal section;

Fig. 3 is a vertical section, showing the pinion in elevation;

Fig. 4 is a cross-section on the line 4—4 of Fig. 3;

Fig. 5 is a front elevation of the connected jaws, indicating in dot and dash lines the external circle of one of the numerous sizes of pinions to which the jaws may be applied; and

Fig. 6 is a side elevation showing the jaws fastened on the pinion of a motor, and the power part of the device about to be brought into cooperative relation with the jaws and the shaft.

The housing of an electric motor is indicated at 2, the armature shaft is marked 3, and the pinion 4.

A pair of jaws 5 of yoke or housing form are provided, to enclose, or partly enclose the pinion, each of these jaws, however, being less than semicircular in extent. Pairs of ears 6 on opposite sides of one of the jaws have swinging bolts 7 pivoted between them, and wing nuts 8 on these bolts cooperate with other pairs of ears 9 on the other jaw, to constitute adjustable fastening means. The jaws may be applied to pinions of varying range of sizes. At their rear ends they are provided with arcuate lips 10 to enter the narrow space behind the pinion, these lips being concaved on their outer faces, as indicated at 11, to clear the projection or collar at the housing.

The power part of the device comprises a hollow housing frame 12 advantageously made of a cup-shaped casting, into which is screwed a front disc 13, the back and front walls 14 and 13 of the frame having central guide openings for a screw thrust member 15. The head 16 of this screw member has a center point projection 17 to center in the end of the shaft 3.

The jaw part and the power part, as constituted, are entirely separate when not in action, yet directly cooperative, and are interengageable after the jaws have been placed upon the pinion.

The jaw part and the power part have interengaging formations for this purpose, whereby the power part is introduced into engagement with the jaw part through, or by, a lateral entrance. The details may be varied. Each of the jaws has cast integral on it a pair of lateral, inwardly facing hooks 18, the hooks of each jaw being in alinement with those in the other jaw.

The frame 12 of the separate power part has lateral straight-sided parallel flanges 19 which are introduced into the hook formations 18, in a direction transversely to the main axis, that is to say, the axis of the motor shaft.

These flanges are guided transversely in engagement with the hook formations 18, to bring the center point 17 in opposition to the end of the motor shaft.

The screw member 15 is turned in the first place to engage and press it against the shaft, by direct manual operation, produced by a wrench-pin 20 in the rear projecting end of the member. This operation is a preliminary, necessary one, the next step being to exert force against the shaft and the pinion collar in opposite directions by the operation of the power means.

The screw 15 is threaded through a nut 21 in the casing frame 12, this nut being incorporated with a worm-wheel 22, preferably by having the worm-wheel teeth formed on the exterior.

A worm 23 meshes with the worm-wheel 22, its journals disposed in transverse bearings 24, 25 in the frame. The projecting end 26 of this worm shaft receives a ratchet 27 fixed thereon, and an oscillatory rocker 28 having a pawl 29 and a socket 30 for a long lever handle 31. The ratchet-lever mechanism, it will be seen, operates in a plane parallel with and at one side of the main axis, that is to say the axis of the shaft or axle from which the pinion or part is to be pulled, or on which, possibly, it is to be pressed. The powerful effort thus exerted does not tend to swing the apparatus about the axis, or to loosen the fit, and an important safety feature results in that the operator stands at one side of and clear of the puller, in case the pinion and puller should suddenly jump off the shaft.

A key pin 32 is mounted slidably in the frame. This pin is pressed by a spring 33 out of engagement with one or more longitudinal key-ways 34 in the screw member 15, and has an external button end 35 by which it may be engaged with one or other of these key-ways to keep the screw member from turning.

It is to be noted that the interiors of the jaws 5 which bear upon the circumferences or teeth of the pinions, are struck on different radii in different portions. Thus, the central, interior portion 36 of each jaw is formed on a shorter radius, while the lateral portions 37 are formed on a longer radius. The apparatus is thereby specially adapted to act upon a wide range of pinions of different diameters, above and below a medium size, giving the greatest possible bearing of the lips 10 for all pinions. Naturally, instead of forming the interiors of the jaws on distinct arcs in different portions, these interiors may be formed on curves gradually changing from one arc to another, in an infinite number of gradations if desired.

In operation, the jaws are first applied to the pinion, with the lips 10 behind the pinion, and between the same and the housing. The bolts 7 are fastened, securing the jaws on the pinion. Then the power part is taken, and with the aid of handle 38 is held so that its straight-sided flanges are over the entrance of the formations 18 of the jaws. The power part is then lowered into this entrance and guide until the center 17 is opposite the center of the shaft 3. The guided interengagement of the parts 18, 19 automatically centers the screw member with the shaft in the lateral sense, and all the operator has to do is to center the screw member with respect to the vertical. Recesses 39 in the rear parts of the jaws afford a clear view of the ends of the screw member and the shaft, for this purpose. The screw 15 is turned by means of the handle 20 until its point presses against the end of the shaft, producing a pressure or tension in the apparatus as a whole. During this operation the key member 32 is held manually out of engagement with the key-way 34, and the nut 21 is held against turning by the worm 23, which is of self-locking, or irreversible, pitch. The parts having been set, the lever handle is inserted into socket 30, and by one or a few throws of the lever exerted in the plane parallel with the axis, the pinion or collar is dragged off its shaft. In this operation, the screw is held against turning by the spring-pressed key 32.

In some cases, the pinion may be "frozen" on the shaft, so that even the great pressure obtainable with a long lever handle in the socket 30 acting through the power multiplying mechanism may be insufficient to dislodge the part. In that event, a smart hammer blow applied to the turned down rear end 40 of the screw member while the parts are under strain will be so magnified in effect that the pinion will be instantly displaced.

It will be seen that the jaws may be applied to a large range of pinions or collars or other parts to be pulled, and that the separate jaw and power parts of the apparatus are interengageable in all adjustments.

While the preferred form and application of the invention has been described in detail, it will be understood that other forms and uses of the invention may be devised, and that various changes in form, details, arrangement, and reversal are permissible within the scope of the appended claims; likewise certain parts of the invention might be used without others. In some cases the power means might be of other than a mechanical nature, and on the other hand the features of the mechanical power means might be used with a different arrangement and relation of jaws; but the complete embodiment of the invention as set forth is preferred.

I claim:

1. A pinion-puller, comprising an adjustable jaw part, and a separate power part, said jaw part comprising a pair of yoke jaws, with

pulling lips, said jaws adapted to be applied at varying degrees of separation on pinions of different sizes, the jaw part and the separate power part having formations interengageable at all adjustments after the jaw part has been applied to the member to be pulled.

2. A pinion-puller, comprising an adjustable jaw part, and a separate power part, said jaw part comprising a pair of yoke-jaws, with pulling lips and fastening means, said jaws adapted to be fastened at varying degrees of separation on pinions of different sizes, the jaw part and the separate power part being interengageable after the jaws have been fastened on the pinion.

3. A pinion-puller, comprising an adjustable jaw part, and a separate power part, said jaw part comprising a pair of yoke jaws, with pulling lips and fastening means, said jaws adapted to be fastened at varying degrees of separation on pinions of different sizes, the jaw part and the separate power part having interengaging formations enabling the power part to be introduced transversely into engagement with the jaws after the latter have been fastened on the pinion.

4. A pinion-puller comprising a pair of yoke jaws having pulling lips and fastening means, and a separate power part, the jaws and the frame of the power part having interengaging formations affording an entrance enabling the power part to be introduced into engagement with the jaws after the latter have been fastened on the pinion.

5. A pinion-puller having separate parts, one part comprising a pair of yoke jaws having lips on their rear ends, and the other part being a power part comprising a frame, a central thrust member, and power means acting between said frame and thrust member, the meeting portions of said separate parts having parallel interengaging hook and flange formations lying at opposite sides of the position of the thrust element, whereby the power part is introduced transversely into engagement with the jaw part.

6. A pinion-puller having separate parts, one part comprising a pair of yoke jaws having lips on their rear ends, and the other part being a power part comprising a frame, a central thrust member, and power means acting between said frame and thrust member, the forward portion of each of said jaws having a pair of hook formations and the frame of the power part having parallel flanges adapted to be inserted and guided straight transversely into engagement with the formations of both jaws.

7. A pinion-puller of separate interengaging parts, one part comprising a pair of yoke jaws with pulling lips and fastening means, the other part comprising a frame, a screw thrust member therein, a worm-wheel nut on said screw member, a worm member journaled transversely in the frame and meshing said worm-wheel nut, and ratchet lever mechanism on the projecting end of said worm member to be operated in a plane parallel with and at one side of the main axis.

8. An appliance for forcing a part relatively to a shaft or axle part, comprising means to coact with one of such parts, a frame, a screw thrust member in the frame to act on the other of such parts, a nut, means for turning said member so as to screw it through the nut, a worm-wheel on said nut, a worm member journaled transversely in the frame, means engageable and disengageable with the screw thrust member to keep the same from turning, and ratchet lever mechanism on the projecting end of said member to be operated in a plane parallel with the main axis.

9. An appliance for forcing a part relatively to a shaft or axle part, comprising means to coact with one of such parts, a frame, a screw thrust member in the frame to act on the other of such parts, a nut, means for turning said member so as to screw it through the nut, a worm-wheel on said nut, a worm member journaled transversely in the frame, and ratchet lever mechanism on the projecting end of said worm member to be operated in a plane parallel with and at one side of the main axis.

10. In a pinion-puller, a pair of adjustable less than semi-circular yoke jaws with arcuate pulling lips, the said jaws being struck on different radii in different portions, substantially as set forth.

11. A pinion-puller, comprising an adjustable jaw part, and a separate power part, said jaw part comprising a pair of yoke jaws with pulling lips and fastening means, said jaws adapted to be fastened at varying degrees of separation on pinions of different sizes and having their interiors struck on different radii in different portions, the jaw part and the separate power part having formations interengageable at all adjustments.

12. A pinion-puller, comprising an adjustable jaw part consisting of a pair of yoke jaws with pulling lips and fastening means, said jaws adapted to be fastened at varying degrees of separation on pinions of different sizes and having their interiors struck on different radii in different portions, and a power part having a frame and a central thrust member, said jaws and said frame having interengagement formations affording an entrance enabling the power part to be engaged with the jaws after the latter have been fastened on the pinion.

13. An appliance for forcing a part relatively to a shaft or axle part, comprising means to coact with one of such parts, a frame, a screw thrust member in said frame to act on the other of such parts, a nut in outward thrust relation to said frame, means

for rotating said member so as to screw it through said nut to set the mechanism in readiness for the forcing operation, and power gearing for then turning said nut relatively to the screw so as to produce the forcing action on said thrust member.

14. An appliance for forcing a part relatively to a shaft or axle part, comprising means to coact with one of such parts, a frame, a screw thrust member in said frame to act on the other of such parts, a nut in outward thrust relation to said frame, means for rotating said member so as to screw it through said nut to set the mechanism in readiness for the forcing operation, power gearing for then turning said nut relatively to the screw so as to produce the forcing action on said thrust member, and disengageable means engageable with said screw thrust member so as to hold the same against turning while being forced endwise by the turning of said nut relatively to the screw.

15. An appliance for forcing a part relatively to a shaft or axle part, comprising means to coact with one of such parts, a frame, a screw thrust member in the frame to act on the other of such parts, means to keep said member from turning, a nut, a worm-wheel on said nut, a worm member journaled transversely in the frame and meshing said worm-wheel, and ratchet lever mechanism on the projecting end of said worm member to be operated in a plane parallel with and at one side of the main axis.

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