Aug. 28, 1923. 1,466,302

F. L. JOUVE

MACHINE FOR SWAGING OR REDUCING METAL

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Fig. 1

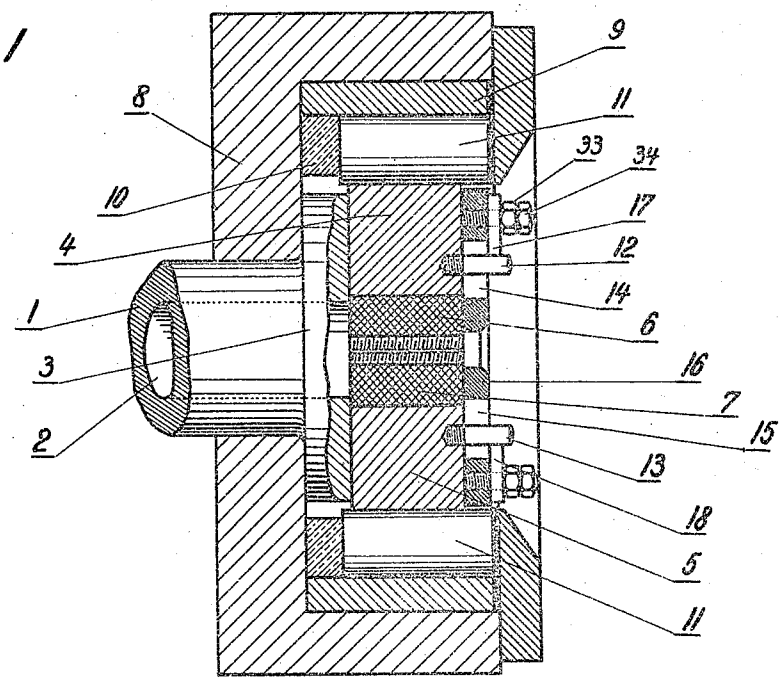
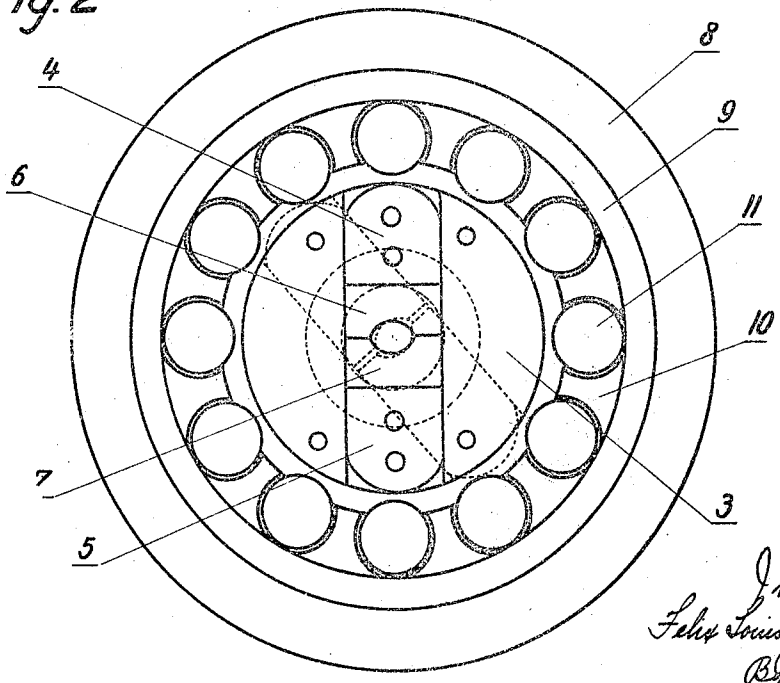


Fig. 2



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Fig. 3

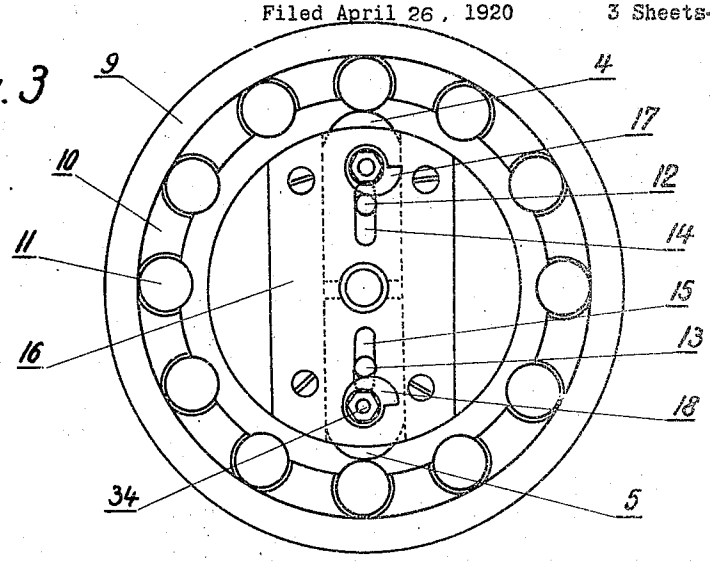


Fig. 4

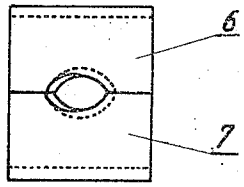


Fig. 6

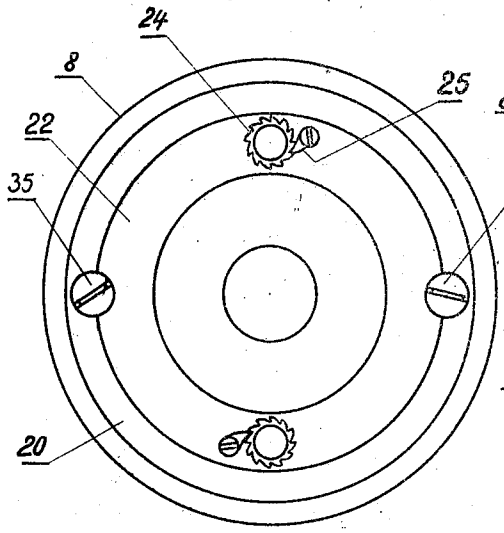
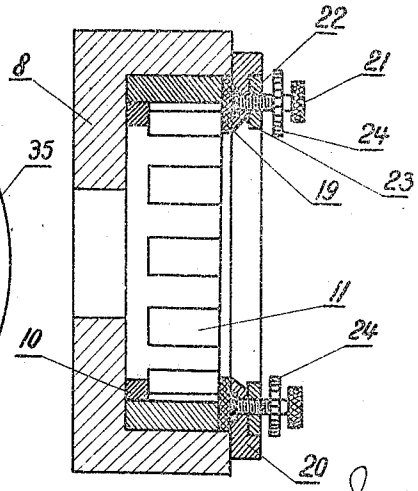


Fig. 5



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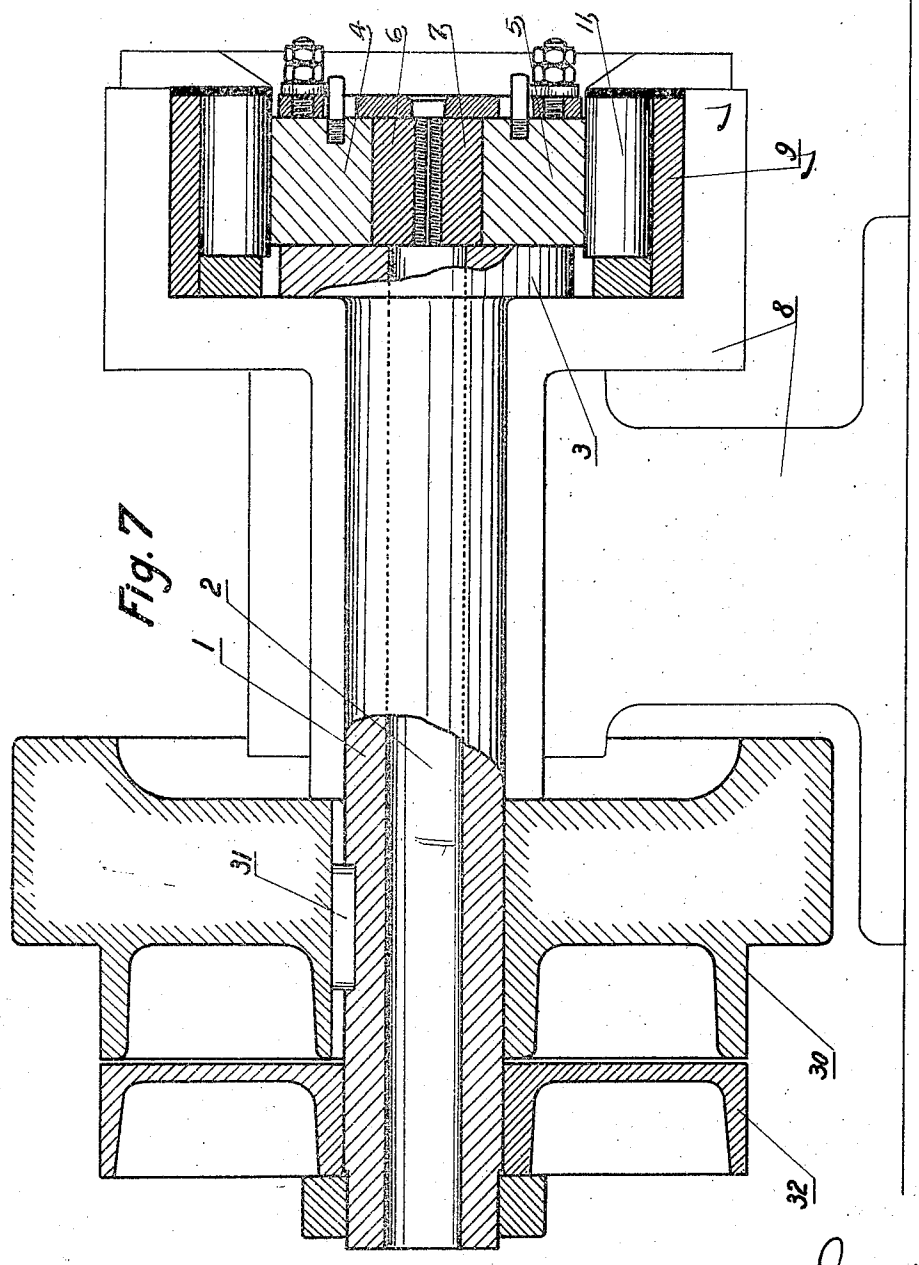


Fig. 7

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Patented Aug. 28, 1923. 1,466,302

UNITED STATES PATENT OFFICE.

FELIX LOUIS JOUVE, OF PARIS, FRANCE.

MACHINE FOR SWAGING OR REDUCING METAL.

Application filed April 26, 1920. Serial No. 376,600.

To all whom it may concern:

Be it known that I, FELIX LOUIS JOUVE, a citizen of the Republic of France, residing at Paris, 3 Rue de l'Orme, France, have invented certain new and useful Improvements in or Relating to Machines for Swaging or Reducing Metal; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present application concerns a machine for producing a screw thread on cold metal by means of dies.

Machines already exist which make a thread on red-hot metal by the means of dies of the draw-plate type which open and close automatically, while by some mechanism adapted for the purpose, the piece of metal on which the thread is to be formed is revolved and moved forward to the extent necessary to obtain the required pitch. The machines do not give accurate results. One of the chief reasons for this is the difficulty of causing the work to revolve and move forward the exact distance requisite to enable the dies to resume contact with it every time in such a position as to continue the thread with perfect truth. Another reason is that when heat is used most metals become more or less oxidized in the process and fragments lodge between the dies and the metal which preclude any accuracy in the formation of the thread.

The subject of the present invention is a machine for forming the thread without the application of heat and in which the feeding forward and revolving of the metal to be threaded are carried out automatically to form a true thread without any special mechanism. This machine is obtained by the transformation of a friction drop hammer of the well known type which is fitted with hammers sliding in a groove across a revolving plate from the center outwards and pressing onto a ring of projecting friction rollers; in traveling around and against the said friction rollers they strike the dies between which the metal to be operated upon is placed. So far these machines have only been used either to reduce the diameter of a cylinder at required points or to make it conical, or, again, to alter its shape throughout (changing it to square, for instance). The first and more general use justifies the name of "Machines à rétreindre" by which they are known in France. The invention consists in transforming a machine of this kind in the following manner:

The dies usually employed for work of the sort mentioned above are exchanged for dies of the draw-plate type having elliptical holes in cross-section and fitted with stops for regulating the stroke; the object of the latter being to prevent the dies from losing contact with the thread when they open and consequently, once the work is begun, to oblige the metal, while advancing and revolving as desired, to preserve an invariably accurate position as regards the said dies.

A secondary feature of the invention consists in the provision, in the form of any suitable appliance, of a brake for the disc carrying the friction rollers, which has a tendency to be involved in the movement of the hammers which press by centrifugal force against it. This brake arrangement allows a larger or smaller number of strokes to be obtained from the hammers per second according to whether the relative speed of the hammer shaft and the friction roller disc is higher or lower, the adjustment being decided by the quality of the work to be performed.

By way of example, one manner of constructing the threading machine in question is described below and shown in the accompanying drawings, wherein—

Fig. 1 is a diametrical section of the part in front of the machine, with some of the parts in elevation.

Fig. 2 is a front view, the device by which the course of the hammers is regulated having been taken away in order to illustrate the working of the hammers.

Fig. 3 is also a front view, showing the arrangement of cams, which permits the regulation of the course of the hammers.

Fig. 4 represents the dies, which are of the draw plate type, and elliptical in shape.

Fig. 5 and Fig. 6 represent a diametrical section and a front view of a special brake device for the friction rollers.

Fig. 7 represents a lateral elevation of the entire machine, partly in section.

Referring particularly to Fig. 7, it must be borne in mind that a friction drop hammer (of the well-known-type here indicated), is principally composed of a rotatable

shaft 1 perforated in its center by a channel 2, and being able to turn in a frame 8. At one of the ends of this shaft there is a fixed pulley 30, which is fastened to the shaft, for instance, by means of a key 31, and a loose pulley which is independent of it. At its other end, the shaft is terminated by a plate 3 which is perpendicular to the shaft. Across the front of this plate is a groove in which slide two hammers 4 and 5, and between the hammers and the center, also in the groove, are two dies 6 and 7. Fig. 2. The plate 3 carrying the hammers fits into a cavity in the framework 8, the interior of which is fitted with a cylinder 9. Into this cylinder 9, a friction roller disc 10 fits loosely, and in the front part of the disc are a certain number of cavities in which the friction rollers 11 are lodged; these contact with the surface of the cylinder on the outer side and protrude to a considerable extent beyond it on the inner side. Friction drop hammers of the well known type in question work in the following manner:

When the shaft 1 is revolved rapidly the hammers 4 and 5 are involved by centrifugal force in the movement, so that their ends press firmly against the rollers 11 of the disc 10. In passing from one roller to another, the two hammers are simultaneously thrust out from the center and then simultaneously thrust back towards it, this action being repeated indefinitely. The piece of metal to be operated upon, which has been placed in the axis of the bore 2 thus receives through the intermediary of the dies 6 and 7 a series of shocks which forge it cold into a shape corresponding with the inner surface of the dies. The friction roller dics 10 being quite loose in its cavity is to a certain extent actuated in the turning movement of the hammers against the rollers. The number of strokes per minute given by the hammers depends on the relation between the speed of the shaft 1 and the movement of the friction roller disc.

According to the invention the friction drop hammer is transformed in the following manner:

A draw-plate of the necessary gauge to give the pitch required is used for the dies 6 and 7. It might be supposed that the drawplates with a circular hole cut exactly in half could be utilized for the purpose. This is not so. It is necessary that when the dies strike the piece of metal, producing in some degree a crushing effect, the latter may be able to back into some available space, a necessity which would not be provided for by dies consisting merely of two halves of a drawplate with a circular hole of the diameter of the screw desired. In order to meet this difficulty the holes in the drawplates are, according to the present invention, shaped in cross section generally like an ellipse the plane of junction being in the large axis of the ellipse and the small diameter of the ellipse being equal to that of the thread to be obtained. For instance, drawplates with semicircular holes of a considerably larger radius than that of the thread to be produced might be used, a sufficient thickness being removed at the base to make the small axis of the elliptical figure thus formed of the diameter of the thread required. The hammers 4 and 5 are provided with gudgeons 12 and 13 working in slots 14 and 15 placed opposite to one another across the center of a small plate 16 secured onto the front of the machine. On the outer side of these slots the gudgeons abut against cams 17 and 18 mounted on shafts. These cams 17 and 18 are loose on the shafts, and maintained in position, for instance by means of a nut 33, and a check nut 34. When a modification of the course of the hammers, and in consequence hereof that of the dies, is wanted, the nut and the check nut are unscrewed; the cam is placed in the desired position, and the nut and check nut once more are tightened up. A brake for the disc bearing the friction rollers may be supplied by means of a washer 19 (Fig. 5) pressed firmly against the front surface of the disc and kept in place by a safety washer 20 fastened to the frame 8, for instance, by two screws 35, 35. The pressure of this washer brake 19 is obtained by a certain number of screws 21 screwed into a fixed washer 22 securely fastened to the front of the machine. These screws pass loosely through the safety washer 20 and press, by the intermediary of a small disc of fiber 23 on the washer brake 19. Each screw 21 carries a ratchet 24 and pawl 25 to regulate and maintain the pressure.

This machine for forming a screw thread on cold metal by means of dies works in the following manner:

The piece of metal on which the screw is to be made is introduced into the axis of the bore 2 between the dies 6 and 7. At the first stroke of the hammers the two dies are thrust against the object to be operated upon, but on account of their approximately elliptical shape they only meet it at their summits and thus produce very short portions of thread on the metal ¼ or ⅓ of half the circumference, for instance; the hammers then open to the extent allowed by the stop regulating the stroke. According to the invention the length of stroke is so calculated that the dies cannot completely disengage from the metal once the thread is begun. At the second stroke, therefore, the dies grip the metal once more, after having turned a certain distance around it, and repeat the process in exact continuation of the thread already made. This operation is performed as many times as necessary. While the dies

rest on the metal or are forced against it, turning each time after almost but not quite disengaging, they carry it with them as they revolve. It thus follows that though the piece of metal being operated upon is involved in the turning movement it does not revolve so quickly as the shaft. As it remains always in contact with the nut formed by the two dies which turn more quickly than it, the piece of metal cannot do otherwise than advance in the axis of the bore. It will therefore leave the machine automatically as soon as the thread is completed.

According as to whether the pitch of the thread be narrower or wider and the furrow more or less deep, the action of the dies should be more or less penetrating, that is to say, the effective force of the hammers must be greater or less. This result can be obtained by controlling the disk carrying the friction rollers by means of some suitable brake device, such as that described above, for example. If the disc carrying the friction rollers were quite stationary the number of strokes per second would be equal to the number of rollers multiplied by the number of revolutions turned by the shaft 1. The radial speed of a hammer is greater or less according to whether it is forced against the protruding end of a roller with more or less rapidity.

The fact that the work is performed by dies without the use of heat causes an absolutely perfect and clean-cut thread to be produced even with soft metals, like copper, such as cannot be effected by turning down. When the metal leaves the machine after receiving the thread it is increased in length to a degree corresponding with the reduction in its diameter. There is no loss of material.

What is claimed is:—

1. Machine for producing screw threads on metal objects by dies, comprising a rotating plate provided with radial grooves, hammers sliding in the grooves, an exterior ring of projecting rollers with which the hammers abut, dies in said grooves in advance of said hammers and forming a thread, said dies being of approximately elliptical shape in cross section, and devices for limiting towards the exterior the course of said hammers, so that the dies completely release the metallic pieces.

2. Machine, as set forth in claim 1, including a brake device for the rollers.

In testimony whereof I affix my signature.

FELIX LOUIS JOUVE.