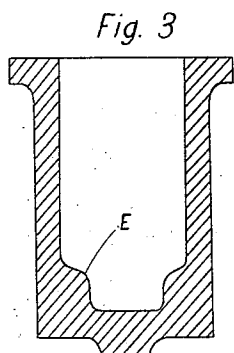
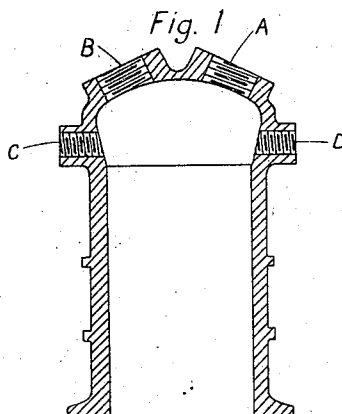
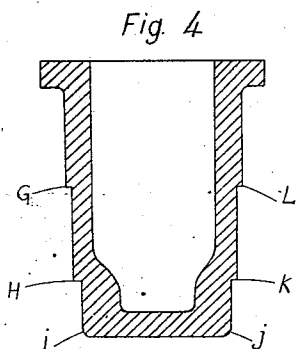
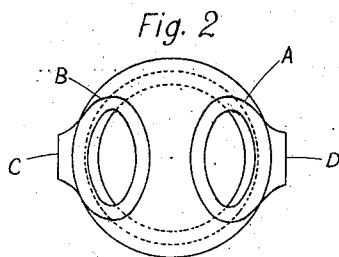


E. FUCHS.
METHOD OF FORGING CYLINDERS OF ENGINES AND SIMILAR STRUCTURES.
APPLICATION FILED OCT. 16, 1918.

1,328,276.

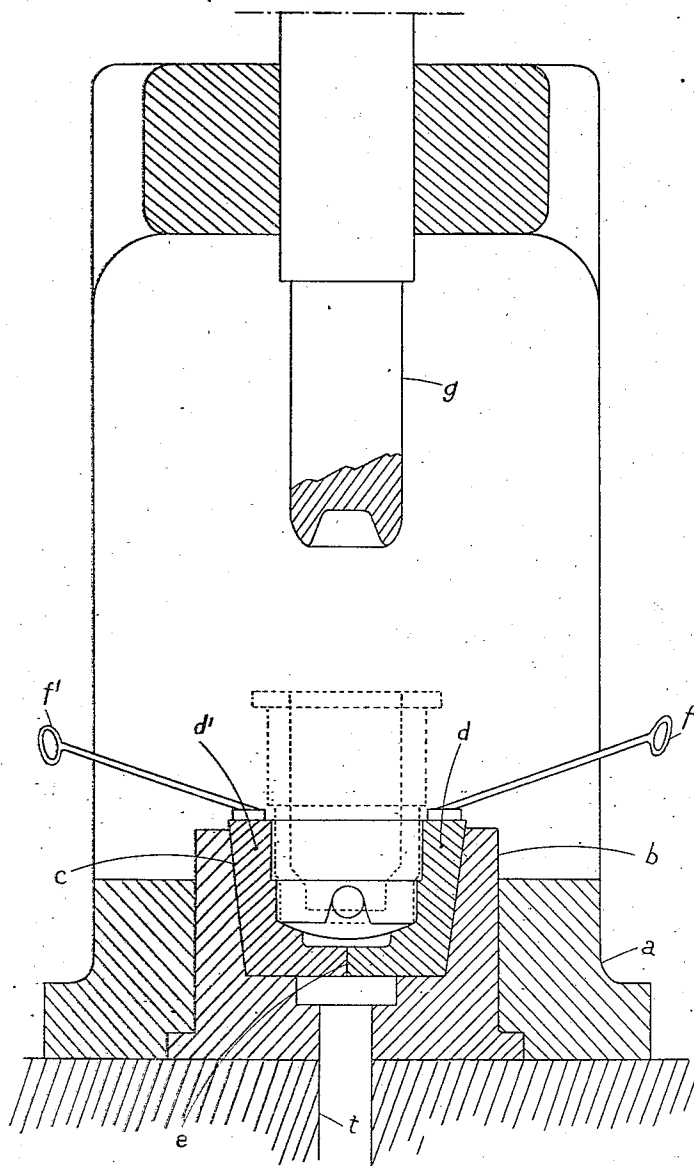
Patented Jan. 20, 1920.

3 SHEETS—SHEET 1.



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Fig. 5



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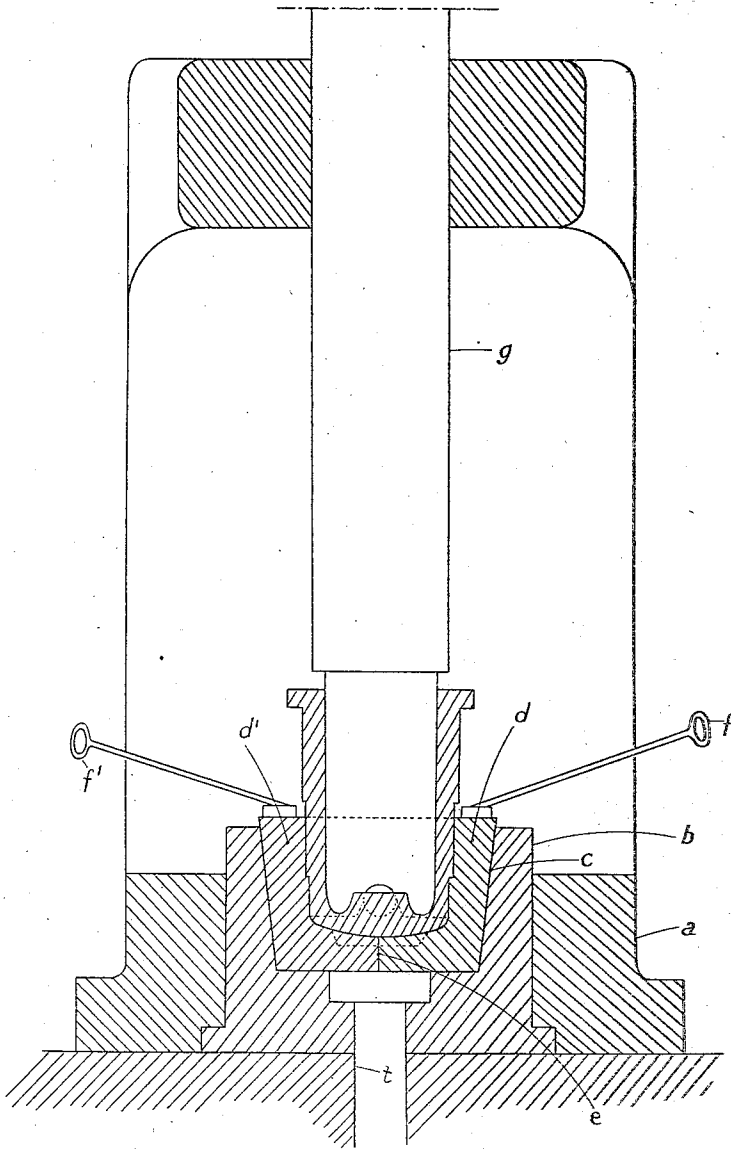
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3 SHEETS—SHEET 3.

Fig. 6



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UNITED STATES PATENT OFFICE.

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METHOD OF FORGING CYLINDERS OF ENGINES AND SIMILAR STRUCTURES.

1,328,276.

Specification of Letters Patent.

Patented Jan. 20, 1920.

Application filed October 16, 1918. Serial No. 258,377.

To all whom it may concern:

Be it known that I, ERNEST FUCHS, engineer, of 111 Boulevard Exelmans, at Paris, Department of the Seine, in France, citizen of the French Republic, have invented certain new and useful Improvements in Methods of Forging Cylinders of Engines or Similar Structures; and I do hereby 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.

This invention relates to a method of forging cylinders of engines or similar structures. The cylinders of engines, and especially of aviation engines, are at present usually made of semi-hardened steel and are entirely machined with very thin walls so as to obtain a minimum weight.

Figure 1 is a vertical sectional view of the cylinder of an aviation motor;

Fig. 2 is a top plan view of the same;

Fig. 3 is a sectional view showing the rough casting;

Fig. 4 is a sectional view showing the casting after it has been externally machined;

Fig. 5 is a sectional view, illustrating the casting in position before the cylinder end has been formed; and

Fig. 6 is a similar view illustrating the form of the cylinder after the end has been formed.

The form usually required to be given to, for instance, an aviation engine cylinder is shown in vertical section and in plan, respectively, in Figs. 1 and 2 of the accompanying drawings.

Referring to these figures, A and B are the bosses in which the gas admission and exhaust pipes are fixed. C and D represent the bosses in which the ignition plugs are secured. These four bosses are generally manually worked by some means in the upper end of the cylinders thus involving considerable labor and expense.

The object of the present invention is to provide an improved method of producing structures of the kind referred to by forging, which shall be less costly in time and labor than the method heretofore generally employed.

The method of forging engine cylinders and the like structures according to this invention consists in first forging a rough model and turning the base and the external

walls, then forging the cylinder head with all the necessary bosses by employing a matrix in two parts and a die or stamp which acts upon the metal in such a manner as to force the metal into all the recesses of the matrix.

By this method the forging is completed at a definite expenditure and by the removal of only a small amount of metal and with a considerable reduction of labor in manufacture.

In carrying out the invention the various operations necessary are as follows: First, a roughly outlined cylinder, the form of which is shown in Fig. 3 of the drawings, is obtained by press-forging in a hydraulic press in a manner analogous to that employed for obtaining the rough outline of shells. The die employed with the said press is given the correct form designed to provide such an over-all thickness of metal in the interior at E as is required for the bosses to be produced by forging.

The end of the rough model is then externally machined as shown in Fig. 4, the parts G, H, I, J, K, L being turned with precision in such a manner that all the models have the same thickness at the end and the same external diameter, these dimensions being determined according to the form of cylinder required to be produced. The cylinder end is then formed by means of the hydraulic press, the detail of which operation will be understood by referring to Figs. 5 and 6, which show respectively the same cylinder in the press before and after the operation of forming the cylinder end.

This operation consists in heating the part of the cylinder end which has to be worked to the desired temperature, introducing the cylinder into a special matrix formed in two parts and having recesses corresponding to the bosses required to be provided on the cylinder, and then operating with a special tool or die in the interior of the cylinder to force the metal of the latter to fill up all the recesses of the matrix.

Referring further to Figs. 5 and 6, *a* is the base of the press, *b* is a block having a conical part at *c* designed to receive the matrix *d*, *d'* which is in two parts the joint being shown at *e*, in order to enable the matrix to be withdrawn when the operation is finished.

The two parts of the matrix are preferably provided with handles *f* and *f'* in order

to facilitate the manipulation and the interior of the matrix is formed with recesses as mentioned above, corresponding to the bosses of the pipes and ignition plugs. The
5 press die *g* is so formed that in descending it acts upon the over-all thickness of the wall at the bottom of the cylinder in such a manner that the metal is thereby forced into the recesses of the matrix, thus producing the
10 required bosses as shown in Fig. 6. The die *g* is afterward withdrawn, the matrix is forced upward by means of the extracting rod *t* and is withdrawn from the mold-box, the two parts of the matrix are separated,
15 and the cylinder is finished.

This method of forging has great advantages of which the following may be mentioned. The external walls of the cylinder head being turned before carrying out the
20 forging the surfaces are thus given a laminated appearance with the result that the cylinder head obtained after forging has a very finished appearance and requires no further treatment beyond the slight amount
25 usually required upon the exterior of the base. The matrix in two parts is of small dimensions and consequently very simple to handle, thus giving an economy in labor as well as in the amount of metal employed in
30 making a cylinder.

In the first operation of forging it is not

necessary to employ a die of special form for forcing the metal into the recesses corresponding to the cylinder bosses, as the desired effect can be produced by employing an
35 ordinary die the external diameter of which just enters within the interior diameter of the cylinder. In these conditions after the bottom of the cylinder has been placed in position in the matrix a certain quantity of
40 pulverulent and refractory material is poured in, either of very fine silicious sand or of coke powder or the like. Pressure being then applied upon the die the latter acts upon the pulverulent matter and forces the
45 metal of the cylinder to fill up exactly all the recesses of the matrix.

Claim:

The method of forging cylinders of engines or similar structures, which consists
50 in forging a rough model, machining the base and the external walls thereof, raising the head of the cylinder to the required temperature and forging the head into the
55 necessary shape.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST FUCHS.

Witnesses:

JOHN F. SIMONS,
ALEXANDER BERSHOLLE.