

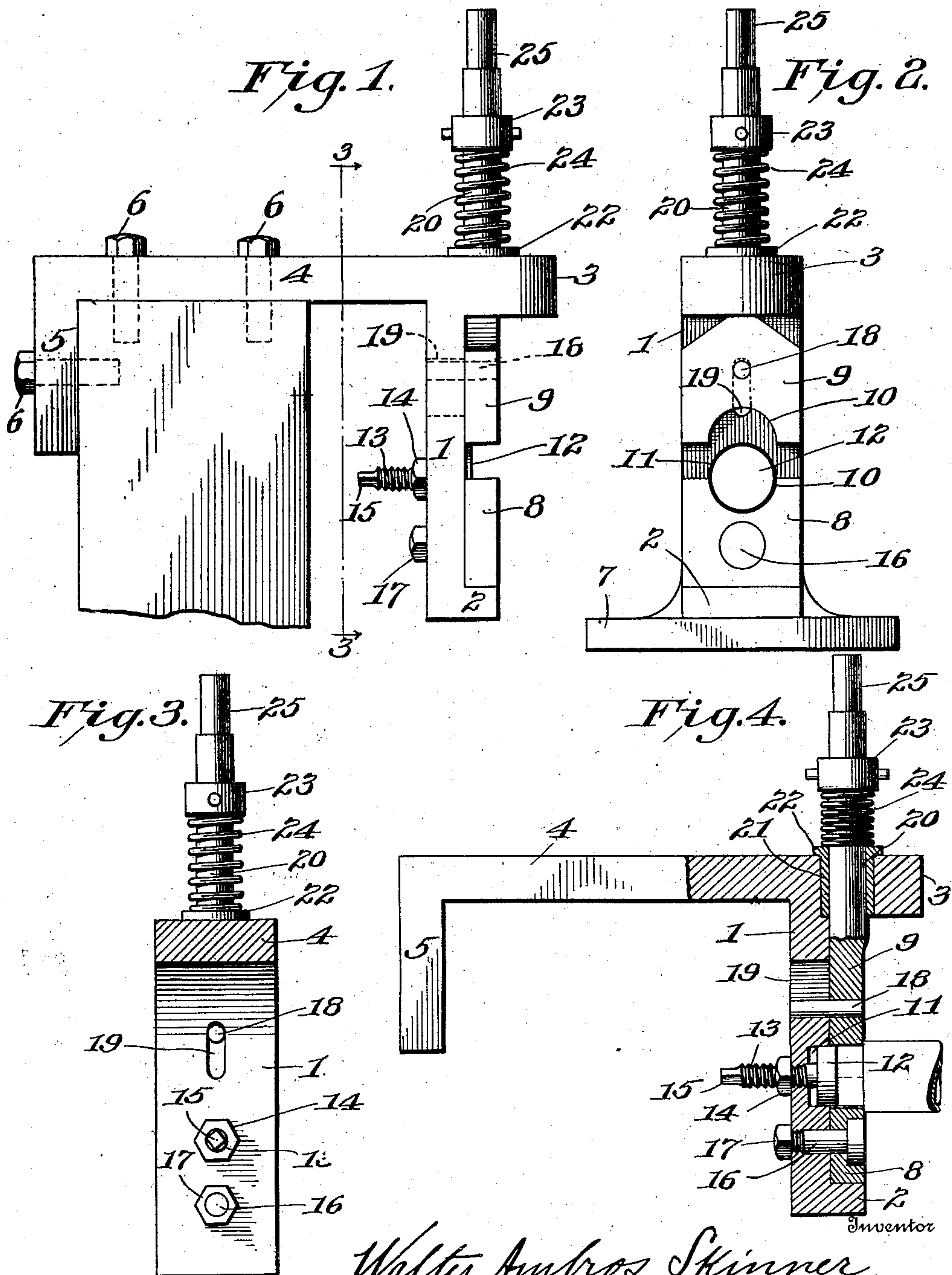
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APPARATUS OR TOOL FOR REDUCING THE ENDS OF BOILER FLUES.

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UNITED STATES PATENT OFFICE.

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APPARATUS OR TOOL FOR REDUCING THE ENDS OF BOILER-FLUES.

No. 889,728.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER AMBROS SKINNER, a citizen of the United States, residing at Macon, in the county of Bibb and State of Georgia, have invented certain new and useful Improvements in Apparatus or Tools for Reducing the Ends of Boiler-Flues; 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 apparatus for swaging the ends of tubes or pipes, more particularly for reducing the ends of boiler-flue-tubes preparatory to receiving the brass or copper ferrules or collars which are usually fitted on such tubes where they enter the boiler-head or flue-plate.

As understood by those familiar with this class of devices, the operation of reducing the flue-tube is performed by holding the end of the tube between co-acting semi-circular dies or swaging tools and turning the tube until its end has been given the proper reduction by the repeated blows of one of the dies imparted from a power-hammer or other suitable repeating power instrumentality. Machines heretofore devised for this operation have been of a rather elaborate nature, usually associated with some special type of power-applying mechanism of more or less complex character, rendering them liable to get out of order; and, by reason of the expensiveness of such machines, they have not been practicable for general use, especially in small machine-shops where one ordinary power-hammer is frequently relied upon for performing various kinds of operations, and where light portable tools or machines of a simple and handy character are demanded for use interchangeably with the same power-hammer.

In view of the foregoing, the main object of my present invention is to provide a thoroughly efficient and practicable, but simple and inexpensive flue-reducing apparatus or device, conveniently adapted as a light portable tool for use with any ordinary power-hammer or other repeating power machine.

As a further object, my invention provides improved means for mounting and operating the reducing dies, whereby they are effectively held in proper working relation

by simple expedients; and means whereby the several parts are conveniently removable, so that dies of different sizes may be employed; and so that new parts may readily be supplied when those in use become worn.

As a further object, the invention provides in combination with the dies an improved adjusting gage whereby the length of the reduction imparted to the end of the flue can be easily regulated.

With these and certain incidental objects in view, the invention will hereinafter be fully described by reference to the accompanying drawings, which form a part of this specification, and then more particularly pointed out in the appended claims.

In said drawings, wherein corresponding parts in the different figures are indicated by the same reference symbols: Figure 1 is a side elevation of an apparatus embodying my invention, showing one form of stock for securing the apparatus in rigid position. Fig. 2 is a front elevation of a similar apparatus shown with its stock constructed upon a base-plate, in which respect alone, the machine here shown differs from that shown in the preceding view. Fig. 3 is a sectional elevation taken on line 3—3 of Fig. 1, looking in the direction of the arrow. Fig. 4 is a central vertical section of the apparatus shown in Fig. 1, representing the dies in closed position upon the end of a flue or tube which has been reduced by the co-action of the dies thereon.

A single casting preferably forms the tool-stock, comprising an upright bar or standard 1 having at its foot a short forward projection or toe 2, and at its head a thick overhanging portion 3. This tool-stock, which carries the co-acting reducing dies, is intended to be mounted upon any suitable support, as either on a stationary block, bed or bench or on a truck or other portable support when it is desired to quickly move the apparatus into and away from proximity to an automatic power-hammer or other repeating power-machine. In operative position, the foot of the stock should preferably rest upon any appropriate anvil, block or other support to sustain the blow from the power-hammer, and the tool-stock should be suitably braced or secured in position for which purpose the stock is shown in Figs. 1 and 5 made with a rearwardly-extending bar

or arm 4 having a depending leg 5, and by means of screw-bolts 6 the said arm 4 and its leg 5 may be fastened to a bench or on a suitable block to hold the apparatus rigid. Or, as shown in Fig. 2, the tool-stock may be erected upon and integral with a base-plate 7, adapted to be attached directly upon its bed, block or other support by fastening screws or bolts entered through suitable holes provided therefor in the said base-plate.

Referring to the reducing dies, the numeral 8 denotes the lower stationary die, and 9 denotes the co-acting upper reciprocatory die which is carried by the foot of a spring-retracted stem, shank or plunger-rod 20 adapted to be operated by the repeated blows of the power-hammer. Said dies 8 and 9 may consist simply of flat blocks arranged one above the other on or against the front face of the standard 1, and having their adjacent ends, which constitute the forming or swaging faces of the dies, made with co-acting substantially semi-circular seats 10, the counterpart of the shouldered end of the flue or tube x after it has been reduced, as shown in Fig. 4; so that when the end of the tube is inserted between the open dies, it becomes reduced by the reciprocations imparted to the upper die by the power-hammer, the tube being turned around during such operation, as well understood. The thickness of the die-blocks 8 and 9 corresponds approximately with the maximum length of reduction which it is desired to impart to the flue-tube.

Behind the opening between the dies, seated in a circular cavity 11 in the tool-stock or standard 1, is a circular plate 12 of slightly less diameter than the opening between the dies when the latter are closed. This plate 12 constitutes a stop or abutment for the end of the flue when inserted between the dies, and provides an adjustable gage for regulating the length of the reduction imparted to the flue. An adjusting screw 13 projects back from the center of the said gage-plate 12, and is tapped through the tool-stock or standard 1 and has a lock-nut 14 screwed thereon to lock the gage in desired position. When the gage 12 occupies the full depth of its cavity 11, the front face of the gage is flush with the front face of the standard 1, in which case the entire thickness of the dies would act on the end of the flue; but, as shown in Fig. 4, when the gage is slightly projected forward, it diminishes the length of tube subjected to the action of the dies. The back end of the adjusting screw 14 is shown provided with a squared or angular head for manipulation by a wrench.

The lower stationary die 8, resting on the toe 2 at the foot of the stock, is fitted in the angle between said toe and the face of the standard 1, and secured rigidly by a single

bolt 16 entered substantially centrally through said die. Said bolt 16, whose head is preferably countersunk in the front surface of the stationary die, extends back through a bolt-hole in the standard 1 and has a fastening nut 17 screwed thereon. Thus by means of this single bolt, the lower stationary die is secured rigidly and in such manner as to sustain the blows of the swaging or reducing operation, while, at the same time, the said lower die is readily detachable by loosening its fastening nut and withdrawing its bolt, so that the die can be readily replaced either on account of wear or where it is desired to change the size of the working dies. The upper reciprocatory die 9, whose vertical stem, shank or plunger-rod 20 works in a bushing 21 secured in a hole therefor in the overhanging part 3 of the stock, is by the guiding of its shank or plunger-rod in said bushing reciprocated in proper coöperative relation to the lower die, and it rides in its reciprocations against the front face of the standard 1, thus guiding and bracing said upper die and preventing it from turning. Said upper die is further braced and guided, to prevent lateral displacement, by a co-acting key-and-groove connection between the die and standard; which connection may be constituted by any suitable key or rib on either one of said members working in a suitable key-way, groove or slot in the other member: but, in the specific construction illustrated, a pin 18 is shown inserted through and projecting from the back of the die 9 and working in a slot or elongated hole 19 in the standard 1. The conjunction of the three simple expedients set forth, namely the guiding of the plunger-rod 20 in its bushing 21, the riding of the die 9 on the front face of the standard 1, and the key-and-groove or pin-and-slot connection 18, 19, between said guide and standard, assures a true and steady movement of the upper die 9 in proper coöperation with the lower die, during the entire operation. The upper die 9 is also, like the lower die, adapted to be readily detached whenever it is desired to change from one size of die to another. To accomplish this, it is merely necessary to lift the bushing 21 out of the hole on which it is fitted and then withdraw the shank or rod 20 from the bushing and through the hole in the part 3, said hole being large enough, when the bushing 21 is removed therefrom, to allow the rod to be inclined sufficiently to withdraw the reciprocating die 9 past the lower die 8 and remove it from the machine. The shank of the same or another die of different size may of course be inserted into the hole and into the bushing, then the bushing may be put back in place, and the apparatus is ready for continued operation.

The bushing 21 has a two-fold function: one whereby it serves to permit insertion or

withdrawal of the upper die-shank or plunger-rod 20 to allow insertion or detachment of the reciprocatory die, as above described; while the other function is the usual one, namely to provide a renewable bearing for the plunger-rod, so that when necessity arises through wear of the bushing, it can readily be detached and replaced by another, thus saving the life of the tool-stock by avoiding direct contact with the plunger-rod. The bushing fits closely within its hole, but not tightly enough to prevent withdrawal. To permit its ready removal, as well as to insure keeping it in proper position, it is provided on its upper end with a collar or flange 22.

Surrounding the plunger-rod 20, between the bushing 21 and a collar or other abutment 23 pinned, keyed or otherwise detachably affixed on the rod 20 at a suitable distance above, is a coiled expansion spring 24 which normally holds the rod and its reciprocatory die in elevated position and retracts the rod and die after each repeated blow or operation of the hammer. The upper end 25 of the stem or rod 20, above its retracting spring, is adapted to be rapidly struck by the repeating hammer, or to be fitted in the tool-socket of the hammer or other repeating power-machine, and for this purpose the upper end of the rod may be machined or turned to fit any particular kind or size of hammer that may be in use in the shop in which the reducing tool is to be operated.

In operation, the apparatus with its support is moved up to the automatic hammer or repeating power-machine, and the upper end of the rod or stem 20 of the reciprocatory die 9 is fitted to the tool-socket of the hammer or otherwise arranged to receive the stroke therefrom. The adjusting gage 12 is set to limit the length of flue which can receive the action of the swaging or reducing dies 8 and 9, and the operator then places the end of the tube against said gage between the dies. Power is then applied, and the series of rapid blows imparted on the tube reduces its end, as shown in Fig. 4, the tube being revolved by the operator as it is reduced.

It will be seen that the apparatus, while practicable and efficient, is of very simple construction, so that it will not be liable to get out of order, and its comparatively low cost will place it within the means of many small machine shops where an elaborate reducing machine combined with a special type of power-hammer would not be practicable. Being a light and handy tool, it can be placed on a portable block, truck or other carriage and quickly moved into position to receive the stroke of a hammer, and removed therefrom at will, leaving the hammer for use for other purposes, which is obviously a great convenience. The utility of the tool is also

increased by the convenient provision for attaching or detaching the dies, providing for the use of interchangeable dies of different sizes, to operate on tubes of different diameters, and providing for the economical renewal of parts when worn or damaged.

The apparatus as shown in the drawings is arranged in an upright or vertical position, but of course it may be used in a horizontal or other appropriate position, according to requirements. In this specification, and in the appended claims, the terms "upper", "lower", "vertical", and other terms of direction, will be understood as used in a purely relative sense.

I claim as my invention and desire to secure by Letters Patent of the United States:

1. A portable flue-reducing machine comprising a tool-stock or standard having a projecting toe at its foot and an overhanging upper part, a stationary reducing die seated on said toe and secured to said standard, a co-acting reciprocatory die guided on said standard and having a shank or plunger-rod working in a guide-opening or bearing therefor in said overhanging part, a coiled expansion spring inclosing said rod above said overhanging part and acting between the same and a collar or other suitable abutment on said rod, and the upper extremity of said rod being free and adapted to be operatively engaged by or connected with a reciprocatory power-hammer or other repeating power mechanism.

2. In an apparatus of the character described, the combination of a tool-stock or standard having an upper overhanging part, co-acting flue-reducing dies arranged on the face of said standard, the lower die being fixedly attached thereto, the upper reciprocatory die riding on the face of said standard and having a key-and-slot connection therewith, said reciprocatory die having a vertical shank or plunger-rod working in a guide-opening or bearing therefor in the said overhanging part, said rod adapted to be operated by a power-hammer or repeating power machine, and a spring acting on said rod for retracting the same after each operation of said power-hammer.

3. In an apparatus of the character described, the combination of the standard, a stationary die secured thereto, and a co-acting reciprocatory die riding against the face of said standard, said reciprocatory die having a shank or plunger-rod, said standard having an overhanging part with a guide-opening therein for said rod, and a removable bushing secured in said opening, said rod working in said bushing and thereby holding said die against the standard, the arrangement being such that the reciprocatory die with its shank or plunger-rod can be withdrawn by lifting said bushing out of its opening, the latter being large enough to allow in-

clining the rod to move the reciprocatory die past the stationary die.

4. In an apparatus of the character described, the combination with the standard
5 having an angular foot and an upper overhanging part, a stationary die fitted in the angle at the foot and detachably secured to the face of the standard by a single fastening bolt, and a co-acting reciprocatory die guided
10 on said standard and having a shank or rod working in a guide-opening in said overhanging part, and means allowing detachment of said upper die, whereby both dies can be detached for replacement.

15 5. In an apparatus of the character de-

scribed, the combination of the standard, a stationary die affixed thereto, and a co-acting movable die working thereon, said standard having a socket in its face confronting the opening between the dies, a gage-plate 20 seated in said socket, and an adjusting screw extending back from said gage-plate and tapped through the standard.

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

WALTER AMBROS SKINNER.

Witnesses:

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