Jan. 16, 1940. R. J. CHAMPAYNE 2,187,110

PNEUMATIC FENDER HAMMER

Filed April 11, 1938 2 Sheets-Sheet 1

Fig. 1

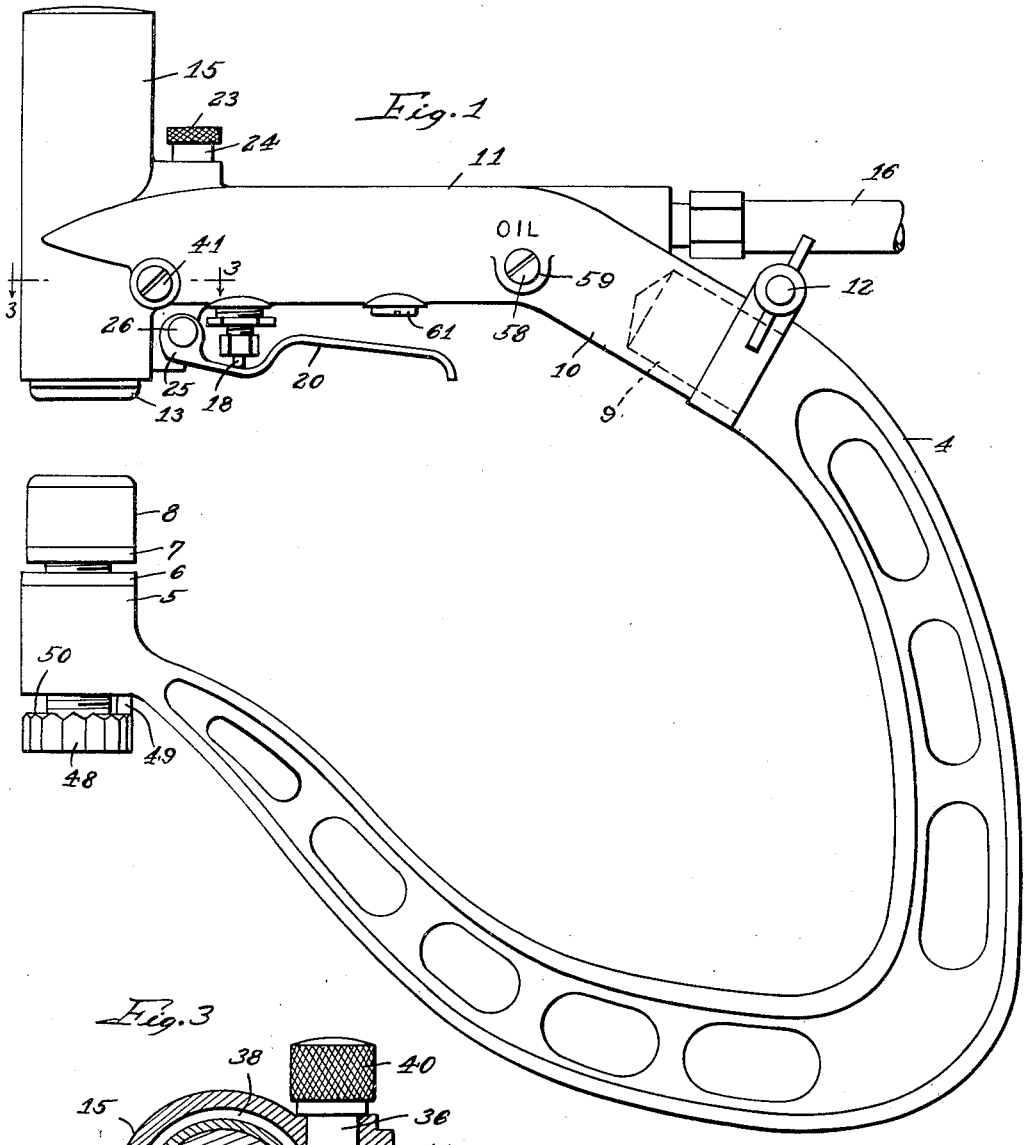
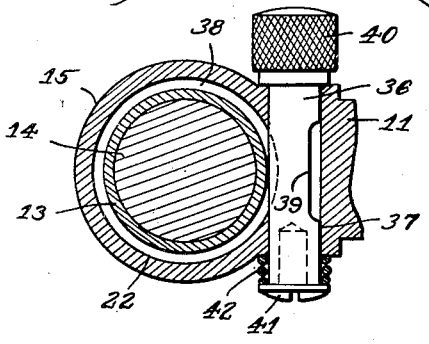


Fig. 3



Inventor:
Roy J. Champayne

By
McCanna, Wintercorn & Morsbach
Attys.

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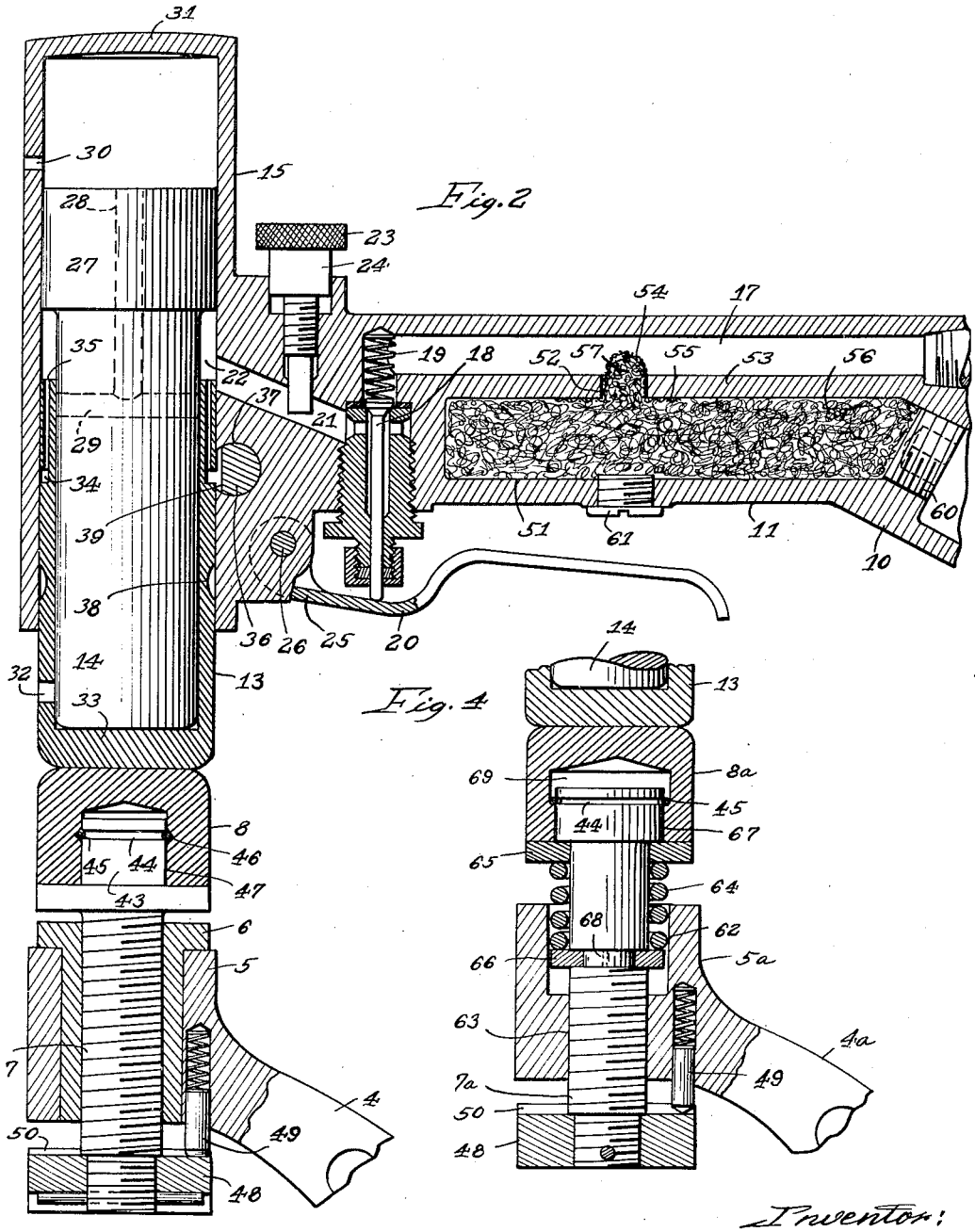

Fig. 2

Fig. 4

Inventor:
Roy J. Champayne
By
McManna, Hintercorn & Morsbach
Attys.

Patented Jan. 16, 1940 2,187,110

UNITED STATES PATENT OFFICE

2,187,110

PNEUMATIC FENDER HAMMER

Roy J. Champayne, Rockford, Ill.

Application April 11, 1938, Serial No. 201,225

20 Claims. (Cl. 153—32)

This application is a continuation in part of my copending application Serial No. 82,499, filed May 29, 1936.

This invention relates to a pneumatic hammer especially designed and adapted for use in removing dents from sheet metal, as in fender and body work on automobiles.

The principal object of my invention is to provide a hammer of lighter weight and one which can be brought into and out of operative position on the work in less time and with greater ease and facility than other fender tools heretofore available. With this object in view, I have constructed the hammer of my invention so that the upper and lower dies can be separated easily sufficiently to permit moving the tool into position, the dies being thereafter arranged to be brought together into engagement with the opposite sides of the work preferably simultaneously with the feeding of compressed air to the hammer.

In the hammer of my invention, the upper die or anvil is extended from the hammer head toward the lower die by air pressure and the dies are constantly forced toward each other under the air pressure, thus allowing the workman to guide the hammer to and fro on the work much more easily than has been the case with other fender tools where the dies were urged together in other ways. This construction also offers the advantage of much greater simplicity and compactness; the hammer mechanism is reduced to three simple and inexpensive parts, to wit: the head or cylinder proper, the piston, and the cooperating extensible die sleeve. The construction also permits the sleeve and piston to be readily removed from the head for inspection, cleaning and oiling, and, of course, these parts being so easily removable can be replaced by new ones, if necessary.

Another object of my invention is to provide a hammer of the kind mentioned having novel means on the head for quickly releasably locking the extensible die sleeve in retracted position, so that when the head is removed or is in a position where the lower die is not in alignment therewith to limit outward movement of the upper die, the latter cannot be expelled.

Still another object is to provide screw threaded adjusting means for the lower die operable conveniently while the hammer is in operation on the work to adjust the stroke of the hammer and the force of the hammer blows, as, for example, to avoid too heavy hammering at the conclusion of a fender straightening operation.

A further object is to provide a hammer of the kind mentioned having the lower die yieldable against spring means on the die holder whereby to absorb vibration and minimize fatigue to the operator holding the handle.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side view of a pneumatic fender hammer made in accordance with my invention;

Fig. 2 is a longitudinal section through the hammer head and adjustable lower die on a larger scale;

Fig. 3 is an enlarged sectional detail on the line 3—3 of Fig. 1, and

Fig. 4 is another longitudinal section corresponding to a portion of Fig. 2 showing a modified or alternative construction.

Similar reference numerals are applied to corresponding parts through the views.

Referring to the drawings, the numeral 4 designates a generally V-shaped yoke of fairly rigid construction having an enlarged substantially vertical cylindrical end portion 5 in which is inserted an internally threaded bushing 6 having a threaded die holder 7 adjustable up and down therein so as to adjust the lower die 8 toward or away from the hammer head and the upper die movable therein. The other end of the yoke has a reduced cylindrical stem portion 9 thereon which is received in the split, hollow, and downwardly inclined end 10 of the handle 11 of the hammer. The bolt indicated at 12 serves when tightened to contract the part 10 so as to clamp the hammer handle to the yoke. The bolt can be loosened so as to permit turning the hammer head out of alignment with the yoke if, as will later appear, it is desired to remove the die sleeve 13 and piston 14 from the head 15 for inspection, replacement, or otherwise. Then too, the bolt 12 will be loosened and the hammer handle detached from the yoke 4 when another yoke of larger size and different shape, suitable for other work, is to be substituted for the yoke 4. For example, I contemplate providing a larger U-shaped yoke, one vertical arm of which will carry the lower die 8 on its upper end and the other vertical arm of which will have an inwardly bent upper end with a stem like the stem 9 for detachable connection with the hammer handle, such a yoke being required in working on deep skirted fenders. Obviously any number of different shapes and sizes of yokes suitable for different kinds of work may be provided. Then too, while I have shown an ordinary cylindrical die 8 with a flat top, it should be understood that three or more different shaped dies will be provided, as, for example, one with a substantially half round top for work on different radii and another one having a narrow elongated bead projecting from the flat top thereof to work in the beads commonly provided on fenders. While I have shown the extensible die sleeve 13 as having a flat bottom surface, it should be clear that I may provide several different interchangeable die sleeves differently shaped at the bottom to suit different kinds of work.

The hammer handle 11 has a flexible air hose

16 connected therewith communicating with a longitudinal passage 17. A valve 18 which is normally held closed by a spring 19, but which is arranged to be opened by means of a trigger 20, controls the flow of air from the passage 17 into another passage 21 leading to the working cylinder 22 in the head 15. The flow of air may be metered to regulate the force of the hammer blows, as desired, by a simple screw type valve 23 adjustable transversely with respect to the passage 21. The shank 24 fitting closely in the hole in the handle 11 holds the valve 23 in adjusted position and eliminates likelihood of its being turned accidentally or due to vibration. The trigger 20 has a forked end 25 pivoted, as at 26, on the front end of the handle for convenient finger operation by the same hand grasping the handle 11 and guiding the tool on the work. The sleeve 13 is a combination sleeve valve member to control the reciprocation of the striker piston 14 and a work hold-down die member to engage the work from above and hold it in place between the dies while it is being hammered by the striker piston. This sleeve has an easy working fit in the open end of the cylinder 22, and the piston 14 has an easy working fit in the sleeve. The enlarged upper end 27 of the piston is of approximately the same diameter as the outside diameter of the sleeve 13, so as to have an easy working fit in the cylinder 22. An axial hole 28 in the upper end of the piston extends downwardly to communication with a diametrical hole 29 a certain distance below the enlarged end 27. Exhaust ports 30 are provided in the walls of the head 15 a certain distance below the closed upper end 31 of the cylinder 22. Radial holes 32 are provided in the sleeve 13 just above the closed lower end 33 thereof, permitting air flow into and out of the sleeve as required in the reciprocation of the piston 14 toward and away from the anvil end 33. An annular external groove 34 is provided in the sleeve 13 a certain distance below its upper end, and one or more longitudinal holes 35 are also provided extending from the upper end of the sleeve to communication with this annular groove.

In operation, it should be clear that one may easily raise the sleeve 13 and the piston 14 with it up into the head 15, and thus provide ample clearance between the lower die 8 and the upper die formed by the sleeve 13 to permit moving the hammer into or out of position on the work. Assuming one has done this to bring the tool into working position, the annular groove 34 is then in register with the passage 21, and if the trigger 20 is operated to deliver compressed air to the cylinder 22, air under pressure finds its way from the groove 34 through the holes 35 in between the top of the sleeve 13 and the bottom of the head 27 of the piston 14, thereby forcing the piston 14 upwardly and the sleeve 13 downwardly. The dies are therefore closed on the work almost the instant the operator depresses the trigger 20, and the piston 14 is reciprocated in the following manner: The piston rises under the pressure of the air acting against the bottom of the head 27 until the diametrical hole 29 passes the upper end of the sleeve 13, whereupon air under pressure flows through the holes 29 and 28 into the space above the head 27, thus forcing the piston 14 downwardly with much greater force than was exerted on the upstroke, there being the full area of the top of the head 27 subjected to the air pressure on the downstroke, as compared to only the annular shoulder defined on the bottom of the head subjected to air pressure on the upstroke. The piston therefore strikes the closed end 33 of the die sleeve 13 with considerable force, sufficient to straighten out dents or unevennesses in the sheet metal that is being operated upon. Just before the impact of the piston 14 with the wall 33 the hole 29 is cut off from communication with the passage 21, as indicated in Fig. 2, and since the air is constantly active against the annular shoulder on the bottom of the head 27, the blow delivered by the piston is cushioned somewhat. The exhaust ports 30 are furthermore uncovered by the head 27 when the piston strikes the wall 33, so that the piston is ready for the next upstroke, and, of course, the cycle just described is repeated over and over. The upstrokes of the piston are faster and with less power than the downstrokes, due to the fact that in the upstrokes the air acts on a smaller area, and in a chamber of little volume, whereas on the downstrokes the air acts on a larger area in a chamber of greater volume. By metering the air with the valve 23 so as to get the right power suitable for a certain piece of work, the workman can thereafter open the valve 18 wide and not have to be concerned with regulating the hammer action as he guides the hammer around on the work. Obviously, all the while that the hammer is in operation the die sleeve 13 is forced downwardly under air pressure to keep the dies 8 and 13 forced together against opposite sides of the work, so that the die 8 is always "backing up" the work properly. The fact that air pressure is used for this purpose, as distinguished from mechanical means employed in other hammers, accounts for the fact that the hammer of my invention may be moved about on the work much more easily and the operation of the tool is generally more satisfactory. For example, whereas it was heretofore usually necessary to grease a fender in order to permit sliding the tool back and forth in operation, the present tool can be operated easily without doing that. Then, too, in finishing up a piece of work, when very light blows are struck by reason of the shutting down of the valve 23, the decreased air pressure active upon the die sleeve 13 makes it that much easier to move the hammer to and fro, thus further facilitating operation. The moment the workman is through hammering a fender, he can quickly remove the tool, because the head 15 drops downwardly of its own weight toward the work when the air is shut off and is no longer acting to hold the head raised off the work. There is therefore sufficient clearance between the head 15 and die 8 for the tool to be moved easily off the work. The present tool is furthermore fool-proof in that it will not operate unless it is held in the correct position, that is, with the dies 8 and 13 normal to the work. The reason for this is that if the tool is cocked one way or another, the die sleeve 13 cannot come down far enough to uncover the end of the passage 21, and accordingly will not permit sufficient air to enter and operate the piston 14. Then too, there is the advantage previously mentioned of the easy removability of the parts 13 and 14 from the head 15, when the handle 11 is turned with respect to the yoke 5. Under those conditions the parts 13 and 14 can be slipped out and in again, and, of course, this permits inspection, replacement, etc.

Fig. 3 illustrates a cylindrical pin 36 mounted for rotation in a transverse hole 37 provided in the head 15 intersecting one side of the working

cylinder 22. An annular external groove 38 is provided in the sleeve 13 which when registered with the hole 37 is adapted to receive that portion of the pin 36 which projects into the cylinder 22 when the pin is turned from the position of Fig. 2 to that of Fig. 3. In the position of Fig. 2, the cut-away flat side 39 of the pin is alongside the sleeve 13, and there is nothing projecting into the cylinder to interfere with reciprocation of the sleeve 13. The sleeve 13 when locked by the pin 36, as in Fig. 3, is in retracted position, as shown in Fig. 1. In this position of the sleeve, the groove 34 is still in communication with the passage 21, so that as soon as the pin 36 is turned again to the position of Fig. 2, the air pressure conducted through holes 35 from the groove 34 will force the sleeve downwardly toward the lower die 8, as previously described. One end of the pin 36 has an enlarged knurled head 40 to facilitate turning. A headed pin 41 pressed into a hole in the other end of the pin 36 compresses a small spring 42 between the head of the pin 41 and the side of the head 15 and there is therefore sufficient frictional drag imposed upon the turning of the pin 36 to prevent its turning accidentally by reason of vibration in the operation of the hammer This locking pin 36 is a safety feature and prevents the sleeve 13 and piston 14 from being expelled under air pressure when the hammer head is removed or is turned to a position on the yoke out of alignment with the lower die 8. Obviously, accidental expulsion of the parts 13 and 14 might cause injury, and at any rate would be objectionable because these parts are made to fit accurately and work smoothly in the head, and if dropped on a cement floor might be damaged, in addition to collecting dirt which would have to be cleaned off before these parts assembled again in the head.

I have found that by screwing up on the lower die holder 7, I can shorten the stroke of the piston 14 and regulate the force of its blows as desired, and this is frequently of advantage at the conclusion of a fender or panel straightening operation where a gentle handling action will permit smoothing up the surface better. Of course, this adjustment may not be used on every job; it will depend upon the gauge of the sheet metal being worked and the nature of the damage being repaired. The workmen will soon learn by experience in the handling of the hammer when it is of advantage to graduate the force of the hammer blows. The die holder 7 has a smooth shank 43 annularly grooved, as at 44, to receive a split spring ring 45 adapted to snap into an internal annular groove 46 in the bore 47 of the lower die 8, whereby to permit quick and easy removal and attachment of dies, but at the same time securely hold the lower die in position and also permit the die holder 7 to be turned with respect thereto for the up and down adjustment of the lower die. A fluted knob 48 is provided on the lower end of the die holder 7 for manipulation thereof. A spring-pressed detent 49 working in a bore in the yoke 4 is arranged to ride into and out of radial grooves 50 provided on the top of the knob 48, whereby to hold the die holder 7 releasably in adjusted position.

It has always been a problem to keep the hammer parts properly lubricated. Graphite has been used with fair success, but due to the air leakage around the sleeve 13 tending to work the graphite out of the cylinder, it is found that insufficient graphite would remain on the surfaces and the moving parts would soon show wear. Naturally, the more the parts became worn the more the air would leak and it became more and more difficult to keep the hammer properly lubricated. Then, too, excessive air leakage is of course objectionable because it adds to the cost of operation and means increased wear and tear on the air compressor. The oiling means herein disclosed, I have found, is a very practical solution to the problem. Very little oil is used because the oil is so finely atomized and enters the hammer as a mist which wets all of the surfaces it contacts, thereby lubricating the same for smooth and easy operation and at the same time affording a liquid seal between the outside of the sleeve 13 and the wall of the cylinder 22 to minimize air leakage. I utilize the incoming air both for atomization and to carry the oil vapor into the hammer mechanism. As clearly appears in Fig. 2, the hammer handle 11 is cored out to provide a reservoir 51 extending nearly the full length of the handle under the air passage 17, and a hole 52 is provided in the intervening wall 53 at a point intermediate the ends of the reservoir for extension of an atomizer nozzle 54 from the oil reservoir up into the air passage. This nozzle may be of any suitable or preferred type, the one shown being made from a piece of fine wire gauze or screen made into the form of a thimble fitting snugly in the hole 52 and having marginally extending flanges 55 bearing against the wall of the reservoir 51 so as to locate the nozzle at the proper elevation in the air passage 17 and prevent its being withdrawn from the hole 52 under the force of the air stream past the nozzle. Any suitable absorbent material like the felt indicated at 56 may be provided in the reservoir to hold the oil and at the same time engage the flanges 55 on the nozzles 54 to hold it in position. This absorbent material projects up into the thimble-shaped nozzle 54 as a wick to draw oil by capillary attraction up into the nozzle 54 where the air impinging upon the nozzle will atomize the oil and carry the vapor along with it into the hammer mechanism. It is believed that the rush of air past the opening 52 will also create a suction to materially aid in drawing oil up into the nozzle 54. Then, too, whenever the hammer is not in use and is laid down on the floor or on a bench, it is obvious that the wick portion 57 inside the nozzle 54 will become saturated with oil so that there will be a plentiful supply of oil ready for lubrication of the hammer the next time it is used, but never enough to produce more than an oil vapor, which is all that is wanted in the present case. The supply of oil in the reservoir 51 may be replenished from time to time by removing the plug 58 from the hole 59 in the side of the handle 11 opening into one end of the reservoir 51. The plug shown at 60 in Fig. 2 is inserted after the reservoir has been filled with felt. The plug 61 closes the hole in the bottom wall of the reservoir in alignment with the hole 52 in the top wall, the bottom hole being required in entering the nozzle 54 and inserting the same in the hole 52. One may enter a tool through the same hole to make certain that there is enough felt packed into the nozzle 54 to give the wick effect described.

Fig. 4 shows the end 5a of the yoke 4a provided with a counterbore 62 concentric with the hole 63 in which the die holder 7a is threaded for up and down adjustment. This counterbore is to accommodate a coiled compression spring 64 and two cooperating washers 65 and 66. The washer

65 fits under the enlarged upper end 67 on which the lower die 8a is slidably received, although retained against accidental displacement by means of the split ring 45 similarly as on the other die holder of Fig. 2. The lower washer 66 is a C washer that can be entered into the annular groove 68 provided on the die holder prior to threading of the die holder in the hole 63 and, of course, prior also to the fastening of the knob 48 on the lower end thereof in the manner illustrated in Fig. 2. The spring 64 is under compression between the washers 65 and 66 and there is sufficient clearance between the upper end 67 of the die holder and the end of the socket in the die 8a, as at 69, to permit the desired amount of yield in the lower die 8a with respect to the upper die 13 in the operation of the hammer, so as to absorb vibration and minimize fatigue for the operator who has to guide the hammer and control its operation by grasping the handle 11.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims are drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. In a tool for ironing and shaping sheet metal, a forked frame providing two arms spaced so as to straddle a piece of work to be hammered, a die on the end of one arm adapted to engage one side of the work, a hammer head on the end of the other arm adjacent the other side of the work, said head comprising a working cylinder for a striker piston provided therein, means for delivering air under pressure to said cylinder, said cylinder having an air inlet port provided in the wall thereof, a sleeve slidable in said cylinder and extensible therefrom under air pressure into engagement with the work, and a striker piston in said cylinder having an end portion reciprocable in said sleeve toward and away from the work, said piston having a radial port provided in said end portion arranged to be covered and uncovered by said sleeve in the reciprocation of said piston, whereby to control the operation thereof.

2. A tool as set forth in claim 1, wherein said sleeve has an annular external groove provided thereon spaced from its inner end arranged to register with the air inlet port in the wall of the cylinder in a retracted position of said sleeve, and one or more passages provided in the wall of said sleeve extending from said annular groove to the inner end of said sleeve.

3. A tool as set forth in claim 1, wherein said sleeve has an annular external groove provided thereon spaced from its inner end arranged to register with the air inlet port in the wall of the cylinder in a retracted position of said sleeve, and one or more passages provided in the wall of said sleeve extending from said annular groove to the inner end of said sleeve, said tool including manually operable means for releasably locking said sleeve in the aforesaid retracted position.

4. A tool as set forth in claim 1, including manually operable means for releasably locking the sleeve against extension from the cylinder under air pressure.

5. A tool as set forth in claim 1, wherein said sleeve has an annular external groove provided thereon spaced from its inner end arranged to register with the air inlet port in the wall of the cylinder in a retracted position of said sleeve, and one or more passages provided in the wall of said sleeve extending from said annular groove to the inner end of said sleeve, said sleeve having another annular external groove in spaced relation to the first groove, and manually operable locking means releasably engageable in said second groove to lock the sleeve in retracted position.

6. In a tool for ironing and shaping sheet metal, a forked frame providing two arms spaced so as to straddle a piece of work to be hammered, a die on the end of one arm adapted to engage one side of the work, a hammer head on the end of the other arm adjacent the other side of the work, said head comprising a working cylinder for a striker piston provided therein, means for delivering air under pressure to said cylinder, said cylinder having an air inlet port provided in the wall thereof, a sleeve slidable in said cylinder having a transverse wall closing the outer end thereof adapted to engage the work, said sleeve being open at its inner end and being extensible from the cylinder under air pressure, and a striker piston working in said cylinder having a reduced end portion reciprocable in said sleeve and arranged to hammer on the end wall of the sleeve, said piston having a radial port provided in said reduced end portion arranged to be covered and uncovered by the inner end of the sleeve in the reciprocation of the piston, whereby said sleeve controls the operation thereof.

7. A tool as set forth in claim 6, wherein said sleeve has an annular external groove provided thereon spaced from its inner end arranged to register with the air inlet port in the wall of the cylinder in a retracted position of said sleeve, and one or more passages provided in the wall of said sleeve extending from said annular groove to the inner end of said sleeve.

8. In a pneumatic hammer of the class described, the combination of a yoke carrying a die to engage one side of a piece of work to be hammered, a cylinder on the other end of the yoke in axial alignment with said die having an air supply port provided in the wall thereof intermediate the ends thereof, and an exhaust port provided in the wall thereof near the closed end of the cylinder, the other end of the cylinder being open, a sleeve slidable in the open end of the cylinder toward and away from engagement with the opposite side of the work from the die, and a piston having one portion reciprocable in the cylinder and a reduced portion reciprocable in the sleeve, said piston having a longitudinal passage provided therein extending from the inner end thereof to a point intermediate the ends of the reduced portion, and a radial passage in the reduced portion communicating with the latter end of said longitudinal passage and arranged to be covered and uncovered by the inner end of the sleeve.

9. A hammer as set forth in claim 8, wherein the outer end of the sleeve is closed and the piston has its reduced portion elongated sufficiently to strike the end wall in the reciprocation of the piston, the sleeve having a relief port in the wall thereof at the closed end.

10. A hammer as set forth in claim 8, wherein said sleeve is slidable inwardly in the cylinder to a position where its inner end covers the air supply port.

11. A hammer as set forth in claim 8, wherein the sleeve has an annular external groove provided in the wall thereof in spaced relation to the inner end thereof arranged to register with the air supply port in a retracted position of the sleeve, the sleeve having a passage extending from the inner end of the sleeve to said annular groove.

12. In a tool for ironing and shaping sheet metal, a forked frame providing two arms spaced so as to straddle a piece of work to be hammered, a die on the end of one arm adapted to engage one side of the work, and an air hammer on the end of the other arm comprising a stationary casing and a hammer mechanism therein comprising two relatively slidable parts both operated by air pressure, the one part being a combination hold-down and air valve member moved endwise under air pressure toward said die whereby to engage and hold the work therebetween under air pressure so long as the air is turned on, and the other part being a ported piston simultaneously reciprocated under air pressure to hammer the work while its air delivery is controlled by the first member by covering and uncovering the ported portion of the piston.

13. In a tool for ironing and shaping sheet metal, a forked frame providing two arms spaced so as to straddle a piece of work to be hammered, a die on the end of one arm adapted to engage one side of the work, and a hammer head on the end of the other arm adjacent the other side of the work, said head comprising a working cylinder for a striker piston provided therein, means for delivering air under pressure to said cylinder, said cylinder having an air inlet provided in the wall thereof, a sleeve slidable in said cylinder and extensible therefrom under air pressure into engagement with the work, a striker piston in said cylinder having an end portion reciprocable in said sleeve toward and away from the work, said piston having a radial port provided in said end portion arranged to be covered and uncovered by said sleeve in the reciprocation of said piston, whereby to control the operation thereof, and means for adjusting said hammer head and first-mentioned die endwise relative to one another so as to adjust the operating position of said sleeve in said cylinder.

14. In a tool for ironing and shaping sheet metal, a forked frame providing two arms spaced so as to straddle a piece of work to be hammered, a die on the end of one arm adapted to engage one side of the work, a hammer head on the end of the other arm adjacent the other side of the work, said head comprising a working cylinder for a striker piston provided therein, means for delivering air under pressure to said cylinder, said cylinder having an air inlet port provided in the wall thereof, a sleeve slidable in said cylinder and extensible therefrom under air pressure into engagement with the work, a striker piston in said cylinder having an end portion reciprocable in said sleeve toward and away from the work, said piston having a radial port provided in said end portion arranged to be covered and uncovered by said sleeve in the reciprocation of said piston, whereby to control the operation thereof, and means for threadedly adjusting the first-mentioned die toward and away from the hammer head, whereby to vary the stroke of the striker piston by changing the operating position of said sleeve in said cylinder.

15. A tool as set forth in claim 1, wherein said sleeve has an annular external groove provided thereon spaced from its inner end arranged to register with the air inlet port in the wall of the cylinder in a retracted position of said sleeve, and one or more passages provided in the wall of said sleeve extending from said annular groove to the inner end of said sleeve, said sleeve being adapted in a certain other retracted position to cover the air inlet port to prevent outward movement of the sleeve under air pressure.

16. In a tool for ironing and shaping sheet metal, a forked frame providing two arms spaced so as to straddle a piece of work to be hammered, a die on the end of one arm adapted to engage one side of the work, a hammer head on the end of the other arm adjacent the other side of the work, said head comprising a working cylinder for a striker piston provided therein, means for delivering air under pressure to said cylinder, a hollow combination companion die member and sleeve valve member extensible relative to said head from said cylinder under air pressure having an end wall to engage the other side of the work as a companion die to the first die, and a ported striker piston reciprocable in said cylinder inside said member and movable toward and away from direct engagement with said end wall while its ports are covered and uncovered by said member as a sleeve valve to control its pneumatic operation.

17. A power hammer for ironing and shaping sheet metal comprising a casing having a working cylinder therein closed at one end, means for delivering air under pressure to said cylinder intermediate the ends thereof, a sleeve valve member slidable in the open end of said cylinder and extensible therefrom under air pressure, said sleeve having a work engaging outer end portion, and a piston reciprocable in said cylinder having a reduced end portion operating in said sleeve toward and away from the work engaging end thereof, said piston having a radial air port provided therein intermediate the ends thereof communicating with a longitudinal air passage provided in said piston extending to the inner end thereof, the inner end of the sleeve being arranged to cover and uncover the outer end of the radial port in the reciprocation of said piston, and said casing having an exhaust port provided in the wall thereof spaced from the closed end of the cylinder.

18. A hammer as set forth in claim 17, wherein the sleeve has an annular external groove provided thereon spaced from its inner end arranged to register with the air inlet of the cylinder in a retracted position of the sleeve and also a passage provided therein extending from said annular groove to the inner end of said sleeve.

19. In a pneumatic hammer, the combination of a cylinder having an air supply port provided in the wall thereof intermediate the ends thereof, and an exhaust port provided in the wall thereof near the closed end of the cylinder, the other end of the cylinder being open, a sleeve slidable in the open end of the cylinder, and a piston having one portion reciprocable in the cylinder and a reduced portion reciprocable in the sleeve, said piston having a longitudinal passage provided therein extending from the inner end thereof to a point intermediate the ends of the reduced portion, and a radial passage in the reduced portion communicating with the latter end of said longitudinal passage and arranged to be covered and uncovered by the inner end of the sleeve.

20. A hammer as set forth in claim 19, wherein the outer end of the sleeve is closed and the piston has its reduced portion elongated sufficiently to strike the end wall in the reciprocation of the piston, the sleeve having a relief port in the wall thereof at the closed end.

ROY J. CHAMPAYNE.

Patent No. 2,187,110. CERTIFICATE OF CORRECTION. January 16, 1940.

ROY J. CHAMPAYNE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, first column, line 29, claim 13, after the word "inlet" insert port; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of March, A. D. 1940.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)