

the time required for shaping each bit ranges from thirty seconds to one minute. A special die is provided for each size to be forged. Bits sharpened in this way are more regular and better than when hand-forged.

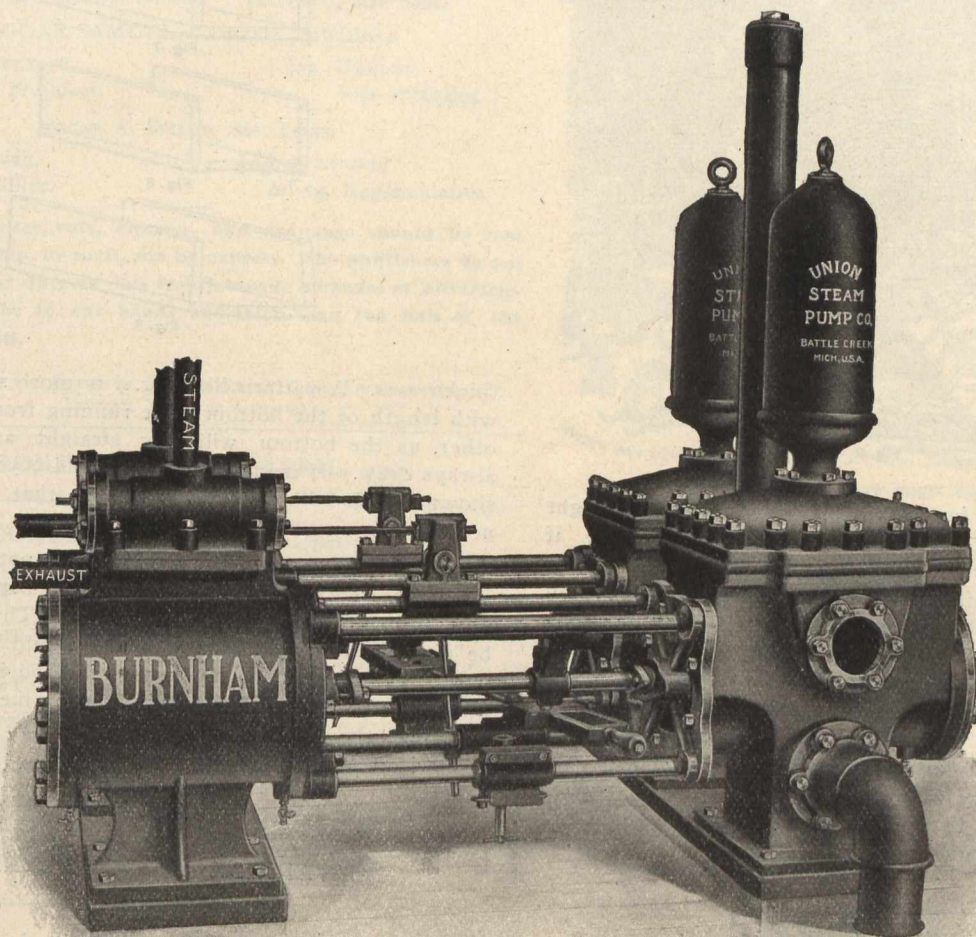
At the United Verde and Homestake Mines one Ajax outfit now does in each case the work formerly requiring twelve men, and the air necessary to sharpen 500 drills in ten hours is about one-fifth as much as that needed to run

one three-inch drill. The Ajax sharpener includes a vertical hammer, consisting of a modified air-drill, with anvil, dies and suitable support and guides, which side-set and forge the wings, and a similar hammer set horizontally and provided with a second set of anvil and dies and a clamp, which does the dolly work and forges up the face of the bit. The general arrangement of the apparatus is shown by the accompanying illustration.

### THE BURNHAM STEAM PUMP.

Through the courtesy of Messrs. Darling Brothers, Montreal, we are enabled to place before our readers something entirely new in the pump line. A brief description

the other one is only at the centre. The link motion used in connecting the valve motion is very simple in construction, and no difficulty is encountered in cutting out either pump, when in operation. Two Burnham pumps connected in this way have all the advantages of a duplex steam pump,



will give some idea of their advantages. The pumps are single cylinder, double acting, and are so arranged that they will operate together, or independently. The valve motions on both pumps are connected by a centering bar, and so arranged that when one pump is at the end of the stroke,

and the fact that they can be run as independent pumps is a feature that will be appreciated by engineers. In a test made with two of these pumps connected as shown, and fitted with 5-inch discharge pipe, reduced so as to carry five pounds pressure, the pulsations were hardly perceptible.

### SMALLEST ENGINE IN THE WORLD.

The smallest engine in the world rests entirely on a five-cent piece. It is owned and was made by John H. Cunningham, an Eaton, Indiana, inventor, who has a fad for making miniature machinery. The little engine operates at a remarkable rate of speed under a pound of steam. So small are some of the parts that a magnifying-glass is necessary to make a proper examination of them. The screws that hold the parts together are made from needles, the threads being so fine as to defy the naked eye. The screws are a fraction of a millimeter in diameter. The fly-wheel measures three-eighths of an inch in diameter. It was turned from steel by Cunningham, who says it is the largest wheel that the engine will turn. The engine has one-sixteenth of an inch stroke; the cylinder head measures one-

eighth of an inch in diameter, while the capped cylinder head measures one-quarter of an inch. The striking boxes are packed with lint scraped from silk thread, cotton being too coarse for the purpose.



### HAND V. MACHINE RIVETING.

In riveting with pneumatic hammers, two men and one heater average 500 rivets in 10 hours, whereas by hand 250 rivets is a good day's work for three men and one heater. The cost per rivet, according to the "Engineering and Mining Journal," was 1.62 cents by pneumatic hammer and 3.68 cents by hand. On 93,480 rivets in a shipyard in Chicago the machine cost was 1 cent to 2.5 cents; the hand cost 2.5 cents to 4.5 cents.