

chipping, caulking, beading, engraving, chasing, stonecutting or planishing. Quite recently an improvement has been made in this all-round useful instrument by increasing its piston stroke to 4", and putting the pistol in a tubular case of cast iron weighing 80 lbs. or more. Its mass absorbs most of the reaction blow which the workman found so distressing to nerve and muscle, but as it requires to be suspended and counterweighed, it is necessarily not as portable, and cannot be used under conditions as confined and awkward as the hammer of shorter stroke and lighter weight. The hose is $\frac{3}{8}$ " diameter and the pressure used from 20 to 100 lbs. At the latter hammer delivers 2,000 or more blows per minute, using of free air per minute 15 cubic ft. at 60 lbs., 18 cub. ft. at 75 lbs. and 21 cub. ft. at 90 lbs., it readily does the work of three men; four is claimed and is possible under some awkward conditions. Men on piece work provided with such hammer accept one-third the old piece-work price. Their cost, duty and freight paid, is from \$150. to \$160. and much of their product is decidedly superior to hand work. This is especially seen in beading over the ends of boiler tubes. Air is used in ordinary vertical smithy hammers, having cylinders 10 in. by 28 in., with what economy is not known, but as no choking exhaust pipe is needed, the exhaust is very free.

RIVETING.

Rivetting tools require little special mention, as any power riveting tool, acting by a single steady squeeze from water or steam, may be worked by air. At most the change is but one of valve or cock, so that all power movements are controlled by one handle, and if desired, the exhaust air may be directed on to the cooling rivet, as in some cases it is on to the point of a drill to keep it cool.

The pneumatic hand-hammer (with its rapid delivery of blows) is well suited for light tank work, that is, for rivets up to $\frac{1}{2}$ in. diameter. The use of this tool—as in hand riveting—requires a holder up. The number of rivets put home per hour, dependent on size, is increased from 50 to 100 per cent. over hand labor. The unpleasant noise it makes is in some quarters an obstacle to its increased use, and as its quickly repeated blow helps to keep up the heat of the rivet, it is probable that this rapid impact hammer will not prove to be as satisfactory on steam joints as it is on tank work, because, in hydraulic riveting, where the dead pressure can be held on the rivet while it is cooling, the amount of caulking required to finish and make a tight dry job is three or four times more than that usually required to make equally good a hand riveted boiler.

HOISTS.

Common shop practice in the home manufacture of air lifts is to use for the cylindrical barrels seamless tubes of iron or brass, smoothed internally by forcing a slug through; for the piston rod cold rolled steel screwed at its lower end into the lifting hook shackle, and for piston head two cast iron disks with one thickness of leather packing between. To secure the satisfactory action of this leather packing a sprung ring of round steel or brass wire cut shorter than the barrel circumference, and bent larger than its diameter, is put inside the turned over edge of the leather packing, and the lower and smaller of the iron disks has cast in it in its outer upper edge a recess to clear and allow for the free play of this sprung wire ring.

The two cast heads or covers, and the barrel which is slightly recessed into them, are held together by through bolts, outside the barrel. So made, of medium length, a 4 in. costs \$18 and a 6 in. \$28.

Under such conditions of cheap make, the friction of working varies from 3 per cent. in the large sizes to 20 per cent. in the very small, that is 4 in. and under. This compares favorably with epicyclic and differential hoisting tackle, but lacks, of course, its certainty of sustaining power.

If two cast iron sprung rings are used as packing in a solid piston