

UNITED STATES PATENT OFFICE.

REX W. LEWIS, OF PORTLAND, OREGON.

DRILL.

1,387,994.

Specification of Letters Patent. Patented Aug. 16, 1921.

Application filed February 25, 1920. Serial No. 361,095.

To all whom it may concern:

Be it known that I, REX W. LEWIS, a citizen of the United States of America, and resident of Portland, in the county of Multnomah, in the State of Oregon, have invented certain new and useful Improvements in Drills, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to drills, and has for its object the production of a drill for cutting metal that is particularly adapted to facilitate and expedite the boring of holes of large diameters.

While my drill is not limited as to size nor in respect to use, it is especially adapted for drilling, expeditiously and in one operation, openings in boiler-heads for the insertion of boiler tubes. Work of this sort requires substantially perfect accuracy of execution in order to insure the necessary fit of the tubes, and has, prior to my invention, necessitated the exercise of much care and skill in its performance, and required a comparatively large consumption of time. By my invention, the work may be done by any ordinarily skilled mechanic at a great saving of time and with reliable accuracy.

What constitutes my invention will be hereinafter specified in detail and succinctly set forth in the appended claims.

In the accompanying drawings—

Figure I is a side elevation of one form of embodiment of my invention complete, and showing my drill of the preferred form for boiler-head work above referred to.

Fig. II is a section on the line II—II of Fig. I.

Fig. III is a section on the line III—III of Fig. I.

Fig. IV is a section on the line IV—IV of Fig. I.

Fig. V is a section on the line V—V of Fig. I.

Referring to the numerals on the drawing, 1 indicates a shank which is preferably made separable from the drill proper, but which is, in effect, made a part of it when the parts are joined together through the instrumentality of a threaded stud-bolt 2 which takes into threaded openings in the cutting ends of the shank and the drill,

The provision of the stud-bolt constitutes an important feature of my invention in that it affords, by reason of its relative dimensions compared to those of the members which it unites, a frangible means for operatively uniting said members. By the term "frangible" in this connection, I designate a quality in the stud-bolt which will give way to excessive stress,—as when the drill sticks,—and by its own breakage affords insurance against wrecking of the drill or of the drill press. This is an item of no inconsiderable practical importance when the size and cost of my drills are taken into consideration.

The drill is characterized by a series of groups of terminally edged cutting blades successively disposed longitudinally of the axis of the drill, the groups of the series being of gradually increasing relative diameters throughout the several successive groups. 3 indicates each one of the cutting blades, say three in number, which constitute an example of one group of blades. They are separated one from another by flutes 4 that extend substantially from end to end of the blades 3 and between the same, and bear an operative relationship to the flutes of the next adjacent group of cutting blades in the series.

By preference, each of the blades 3 is inclined to the axis of the drill, is provided with a clearance shoulder 5, and is provided with a terminal cutting edge 6. The cutting edges 6 defining the lower ends of the blades 3, respectively, are the cutting edges proper, and may be kept sharp by grinding or otherwise, so long as any portion of the blades remains.

The flutes 4 preferably extend below into a substantially circular zone 7, which may, if preferred, constitute the terminal portion of the drill, and, in operation, may be introduced into a previously formed drill-hole or guide aperture, operating therein as a pilot. If, preferred, however, the zone 7 may be extended in the form of a two-fluted cutting drill-point 8 of any usual or preferred twist-drill variety having a boring capacity. The drill-point 8 being non-essential, may be, when used, made integral with the zone 7 or detachably united to it, as pre-

ferred. When used, it carries those which may be designated the first cutting edges 9 of my drill, of which, in such case, the cutting edges 6 of the blades 3 constitute the second of the series, and so on throughout all the groups of the series whatever be the number thereof. On the other hand, if the drill-point is omitted, the cutting edges 6 constitute the first of the series.

Upon each of the blades 3 the shoulder thereof defines a longitudinally disposed working face 10, whose external curvilinear contour is coaxial with the drill. Each working face 10 is provided with a sharp forward edge 11, which may shear away to smoothness any of the cut of the metal that the edges 6 may leave, but an important function of the collective faces 10 is to afford a centering support and axial guide to the drill, for which reason their number preferred is three, as affording, in effect, a tripod support. Each edge 11 is defined by a straight line angularly disposed according to the rule of construction adopted, in definite relationship to a corresponding edge 12 of a reamer-blade 15. Between adjacent reamer-blades 15 are disposed intermediate reamer-blades 16, and all are substantially parallel to the axis of the drill and one to another. All of the reamer-blades, whose number is preferably a multiple of the number of the blades 3, being, in the form of my device illustrated, nine, terminates in a drill cutting-edge 17. The edges 17 collectively form the last of the series of cutting edges, and effect a final drill-cut into which the reamer-blades, in the final operation, are fed with ultimate smoothing and truing effect upon the finished aperture well formed by them. The reamer-blades 15 and 16, inclusive, are, without distinction, separated one from another by flutes 18. Consequently, the cutting edges 17 may be re-sharpened or re-ground until the available metal of the reamer-blades is exhausted.

The flutes 18 correspond in number with the reamer-blades which they define, and are provided, preferably, in number multiple to the number of flutes 4. In the example illustrated, the flutes 4 being three in number, the number of the flutes 18 is nine. Each flute 18 is made, through the reduction of diameter afforded by the forming of the edges 17 on the ends of the reamer-blades, to communicate in effect with a flute 4. With like effect the communication of the flutes of one group of blades successively with those of another affords ample clearance without obstruction for all material cut by the drill in operation.

The drill illustrated constitutes the preferred form of embodiment of my invention, but I desire to have it understood that I do not limit myself to mere details of construc-

tion, nor to the number of groups of cutting edges in series, it being obvious that the same may be, if desired, increased within the scope of the principle of my invention.

In operation, the shank 1 being operatively onnected as with a drill press as by insertion into the chuck thereof, for example, power is applied to rotate the drill and to impart to it the longitudinal feed desired. If the drill-point 8 be employed, the drill may be driven in one operation through an imperforate plate, a boiler head, for example. If preferred, however, the plate may be first provided with properly located and collocated initial apertures or drill-holes which are intended, severally, to serve as guides to the zone 7. In the latter case the cutting edges 6 and 17 successively act upon the plate to enlarge the initial apertures to the final openings of the diameter desired, the axis of the initial apertures and of the final openings being constant. The operation of the drill in either case is analogous to that of a broach and is effected without excessive strain upon the drill and with a firmness and rigidity of movement throughout the entire operation which not only insures against any deviation from the true axis of the drill, and, consequently, of the bore made by it, but insures, through the final reaming operation of the blades 15 and 16, the shaping to the degree of precision, of the reamed walls of the final aperture made by the drill in the plate. Such degree of precision is essential to the practicability of an instrument of the kind described; and to that precision the series of cutting edges of my drill, in respect to their construction, their successive relationship one to another, and the relationship of their parts each to each, effectually contributes.

What I claim is:

1. A tool for boring boiler tube holes in boiler plate comprising more than two cutting sections each acting as a pilot for the succeeding one, the second section having a small and odd number of cutting blades of sufficient depth to greatly enlarge the hole by which it is piloted and its succeeding section having a number of cutting blades which are a multiple of that of the preceding section, but substantially shallower and exceeding but slightly the external diameter of the next preceding section.

2. A tool for boring boiler tube holes in boiler plate comprising more than two cutting sections each acting as a pilot for the succeeding one, the second section having a small and odd number of cutting blades of sufficient depth to greatly enlarge the hole by which it is piloted and its succeeding section having a number of cutting blades which are a multiple of that of the preceding section, but substantially shallower and

exceeding but slightly the external diameter
of the next preceding section, the cutting
blades of the said second section being
spirally disposed to the longitudinal axis of
5 the tool and the blades of the final section
being parallel thereto.

In testimony whereof, I have hereunto set

my hand in the presence of two subscribing
witnesses.

REX W. LEWIS.

Witnesses:

JOSEPH L. ATKINS,
LEICESTER B. ATKINS.