This invention relates to machines for breaking concrete or the like.

It has hitherto been customary to break up concrete or similar masses forming road surfaces or the like by means of percussive tools operated by compressed air or other sources of power and held and supported by the operator. Such tools have necessarily been of relatively small power and weight and it has not been possible to provide means for silencing the noise created by the impact of the bit upon the concrete surface, which comprises a large proportion of the noise caused by such machines.

An object of the invention is to provide a machine for breaking concrete or the like in which the weight, or power, or both, of the tools used may be materially increased.

Another object of the invention is to provide a machine for breaking concrete or the like in which the noise caused by the impact of the pick or picks on the concrete is materially reduced.

Yet another object of the invention is to provide a machine for breaking concrete or the like comprising one or more percussive tools mounted on a mobile frame and enclosed in a sound absorbing casing which extends down to the surface on which the tools act and surrounds the picks.

With these and other objects in view, the invention consists in the improved combinations and arrangements contained in the embodiments now to be described in detail, the novel features of which are set out in the claims which follow.

In the accompanying drawings:

Fig. 1 is a side view of one form of improved concrete-breaker.

Fig. 2 is a plan of the concrete-breaker shown in Fig. 1.

Fig. 3 is a cross-section of part of the concrete-breaker.

Fig. 4 is an end view of one modified form.

Fig. 5 is a plan of this modification.

Fig. 6 is a side view of this modification, and

Fig. 7 is a side view of another form of improved concrete-breaker.

In the form shown in Figs. 1 to 3 a carriage having a pair of front wheels 2 and a back wheel 3 which is of the castor type so that the carriage can be moved about readily in all directions.

A horizontal platform 4 having an annular track 5 is supported by the carriage. A turntable frame 6 is pivoted to the platform 4 by a pivot shaft 7 at the centre of the annular track and is supported by rollers 8 running on the track 5. These rollers are rotatably mounted beneath the frame 6 with their axes radial.

The turntable frame carries a supporting structure 9 at the top of which is mounted a jib 10 which extends forwardly of the carriage. The jib 10 is pivotally supported at the fulcrum 11 and is balanced by a counterweight 12.

The jib 10 is formed of a pair of spaced channel members forming rails 13, suitably braced. The rails 13 provide a track on which the pneumatic drill of the concrete breaker can be moved towards or away from the carriage 1.

The pneumatic drill is surrounded by a casing on which are mounted stub axles 14 carrying rollers 15 which engage the rails 13. There are two rollers on each side of the casing so that the drill is supported at four points at an appropriate angle, and does not tend to pivot about the supports.

The drill assembly is moved along the track of the jib by means of endless ropes 16, 16' which pass round guide pulleys 17, 17' at the extreme end of the jib and round winding pulleys 18, 18' at the inner end of the track, the drill assembly being fixed to the top run of the rope. The winding pulleys 18, 18' are mounted on a cross shaft 19 and can be rotated by the handle 20 to move the drill assembly in either direction.

The drill assembly is shown in Fig. 3 and comprises a double-walled annular casing 21, and top and bottom casings 22, 23 also of double-walled construction covering the top and bottom of the annular casing 21.

Within the casing 21 a pneumatic drill 24, of any suitable design is mounted so as to be movable axially in the casing. Air is supplied to the drill through a hollow rod 25 which passes through a central aperture in the top casing 22 and which also acts as a guide for the drill. The tool-bit 26 passes through an aperture 21 in the bottom casing 23 and this casing is preferably detachably connected (for example by quick-release bolts 28) to the annular casing 21. The annular casing is long enough to ensure that the drill can move within its distance sufficiently for the tool-bit 26 to penetrate into the concrete to the desired extent and its internal diameter is such that a space is left between the external wall of the drill and the inner wall of the casing.

The internal walls and bottom extreme plate of the casings are perforated and the spaces between them may or may not be filled with sound absorbent material. The drill assembly is supported from the jib 10 so that the drill is at a suitable angle to the concrete to be drilled and...
the bottom casing 23 is shaped so that its base is horizontal. Sealing members comprising hollow tubes 25 and 53 of ring form are fixed to the bottom of the bottom casing 23, one of these tubes, 29, being fixed at the edge of the bottom of the bottom casing and the other 30 surrounding the aperture 27; this tube may be split longitudinally, to increase its flexibility. The hollow tubes 29 and 30 are preferably of rubber or other resilient material.

Means are provided for raising the drill 24 relatively to the casing. A cylinder 31 is mounted on the top of the top casing 22 and has sealing glands 32 and 33 at each end thereof. The hollow rod 25 fixed to the drill passes through these glands 32 and 33 and carries a piston member 34 which is slidable in the cylinder 31. Compressed air can be passed into either end of the cylinder through passages 35 and 36. The compressed air is brought from a compressor through a flexible hose 37 to a valve 38 which can be set to direct the air either to the passage 35 by way of the pipe 39 or to the passage 36 by way of the pipe 40. Air for actuating the pneumatic drill is led into the drill through the hollow rod 25 which is connected by a flexible, and preferably armoured, hose 41 to T in the pipe 40.

The jib 10 can be moved about its fulcrum 11 to raise or lower the drill assembly as a whole.

A cylinder 42 is pivoted to the turntable frame 6 and has mounted therein a piston 43 which is connected by the piston rod 44 to the jib 10. The rod 44 is pivotally connected to the jib 10, preferably between the fulcrum 11 and the counterweight 12.

Air is led from a compressor through a flexible pipe 45 and a valve 46 to the cylinder 42, the setting of the valve 46 determining to which end of the cylinder the air is led.

When the machine is to be used for breaking concrete such as the surface of a road, the drill assembly is moved out to the end of the jib which is raised by supplying air to the top of the cylinder 42 above the piston 43. The machine is then wheeled into position and the jib swung about the pivot 7 so that the drill assembly is near the edge of the concrete and to one side thereof.

The valve 46 is then fixed so that compressed air is admitted to the cylinder 42 below the piston 43, thereby lowering the drill assembly until the sealing members 28 and 30 are on the concrete. The assembly can be caused to press the sealing members against the concrete by forcing the piston 43 upwardly and this pressure is sufficient to ensure a substantially airtight joint between the bottom of the casing 23 and the concrete.

Up to this moment the drill 24 has been held with the tool-bit 26 clear of the concrete, by compressed air in the lower part of the cylinder 31 pressing the piston 34 upwardly. When the assembly has been lowered into position, the valve 30 is moved to admit compressed air into the top of the cylinder 31 above the piston 34 and thus move the drill downwardly until its tool-bit 26 comes into contact with the concrete.

At the same time, compressed air passes through the hose 41 and hollow rod 25 to the drill which is then operated to drive the bit 26 into the concrete. The weight of the drill may be sufficient to cause the drill to bite into the concrete or compressed air in the top part of the cylinder 31 may be used to press the drill into the concrete.

When the tool-bit 26 has been driven to the required depth, the valve 38 is moved to admit air to the lower part of the cylinder 31. The piston 34 is thus raised and raises the drill. It will be seen that considerable lifting force can be exerted on the drill so that even if the bit should become jammed in the concrete, it will be readily released by moving the valve 38 to admit air into the lower part of the cylinder.

After the drill has been raised, the jib 10 is also moved by raising the valve 45 to admit air to the cylinder 42 above the piston 43. This makes the drill assembly clear of the ground and the jib can then be swung about the pivot 7 to bring the drill into position for drilling another hole in a similar manner to that described above. A row of holes is thus drilled across the width of the concrete.

When this row has been drilled, the drill assembly is moved back a short distance along the jib 10 by rotating the handle 20, which moves the ropes 16, 16' and causes the assembly to move along the rails 13 on the rollers 15. A second row of holes is then drilled and the process is continued until the drill assembly has been moved back to the position shown in dotted lines in Fig. 1. The machine as a whole can then be moved on the wheels 2, 3, to another suitable position.

The noise caused by the operation of the drill 24 will be considerably reduced, since the whole of the drill including the tool is enclosed in sound-absorbing material.

The noise created in the cylinder of the drill 24 will be absorbed and substantially reduced in volume in passing through the double-walled casings 21, 22, 23. Similarly, the sound waves set up by the impact of the tool-bit 26 on the concrete will have to pass through the absorbent material in the bottom member 23 and in the casing 21 and will be absorbed thereby so that a substantial reduction in the volume of noise coming from the machine will be obtained.

If it should be necessary to change the bit 26 or to make other adjustments to the drill, the jib 10 can be raised by means of the piston 43 and cylinder 42 and the bottom casing 23 of the drill assembly removed by undoing the quick-release bolts 28.

Since, in the improved concrete breaker, the machine is not held by the operator, it is possible to increase greatly the number of bits driven by one machine and one embodiment of this idea comprises the modified form shown in Figs. 4, 5 and 6.

A number of pneumatic drills (for example, ten) are mounted in line, each pair of drills or, if preferred each drill, being surrounded by a silencing casing 51 which may be similar to the silencing casing described above. These casings 51 are supported by pivoted links 52, from a frame 53 which is mounted at one end of a wheeled carriage 54.

Means are provided for raising the casings 51 with the drills relatively to the frame 53. A shaft 55 is mounted transversely of the frame 53 and is rotatable by an arm 56. A threaded rod 57 pivoted at 57' to the frame 53 passes through the outer end of this arm 56 and a nut 58 is rotatable on the rod 57, by means of a hand wheel 59. Rotation of the hand wheel 59 moves the outer end of the arm 56 along the rod 57 and rotates the shaft 55. Lifting levers 60 mounted on the shaft 55 and engaging abutments 61 on the casings 51 are thereby caused to raise or lower the casings 51.

The frame 53 is mounted on a cross shaft 62 carried at one end of the carriage 54 and can be turned about its supports so as to lie substantially horizontally. A toothed segment 63 75
is fixed on the shaft 62 and is engaged by a worm 64 rotatable by the hand wheel 65, rotation of the wheel 65 pivoting the frame 53 with the drills about the shaft 62. A balance weight 66 is provided to balance the weight of the frame and casing.

The carriage 54 is provided with front and back axles 67 on which are mounted wheels 68. These wheels may be adapted to run on rails (not shown) which are laid down to form a railroad.

For the drills are supplied with compressed air through hollow rods 69, each connected by flexible hose 70 to the inlet to the top of the corresponding lifting cylinders 72. All the inlets to the top of the cylinders are connected to a common header 71 by flexible hose 77. These compressed air cylinders 72 are similar to the cylinders 31 described with reference to Figs. 1 to 3 and are operable to raise or lower the drills relatively to the concrete. These cylinders are connected in parallel to common headers 71, 73 to which compressed air is supplied from an air reservoir 78 (supplied from a compressor 74) through the flexible hose 75 and under the control of the valve 76. With the valve 76 in one position, compressed air is supplied to the header 73 and from there simultaneously to each cylinder 72 so that all the drills are lifted together. On moving the valve 76 to another position, compressed air is supplied by way of the header 71 to the other end of the cylinders 72 to lower the drills and also to the hollow rods 69 to actuate the drills.

When a length of concrete is to be broken up, the machine is moved on its wheels 68 to the end of the concrete preferably on rails laid down at the sides of the concrete. Compressed air is admitted to the machine to actuate the tools and to drill a series of holes across the width of the concrete. The machine is then moved back to drill another series of holes and the process is repeated until the complete length of concrete has been broken up.

A simple form of the improved concrete breaker which can be propelled and manipulated by one person is shown in Fig. 7. The drill is mounted in a casing 101 in a similar manner to that described above and a compressed air cylinder 102 is provided to raise and lower the drill relatively to the casing. Compressed air is led to this cylinder 102 through the flexible hose 103 and is directed by the valve 104 to inlets 105, 106 at the top or bottom of the cylinder as required. The drill is supplied with compressed air through the hollow rod 107 and the flexible hose 108 which is connected to the inlet 105 at the top of the cylinder.

The casing 101 is supported in a wheeled truck 109 having wheels 110 and curved handles 111. The handles are situated immediately behind the casing when this rests on the ground. By bearing down on the handles 111 the operator can pivot the machine about the wheels to raise the casing from the ground and the whole machine can then be readily moved from place to place.

It will be understood that the invention is not restricted to the forms specifically described but includes such modifications as come within the ambit of the accompanying claims.

I claim:

1. A machine for breaking concrete or the like comprising a sound-proof casing movable to contact with and enclose an area of the surface being drilled, a percussive tool within the sound-proof casing and operable to drill within the enclosed area, and a mobile frame having a pivotable jib member, said casing being movable along said jib member.

2. A machine for breaking concrete or the like comprising a sound-proof casing movable to contact with and enclose an area of the surface being drilled, a percussive tool within the sound-proof casing and operable to drill within the enclosed area, a mobile frame, a jib member capable of being raised or lowered or slewed relatively to the mobile frame and means for suspending said sound-proof casing and percussive tool from the jib member.

3. A machine for breaking concrete or the like comprising a sound-proof casing having perforated double walls enclosing sound absorbing material, said casing being movable to contact with and enclose an area of the surface to be drilled, a percussive tool within the sound-proof casing and operable to drill within the enclosed area and a mobile frame supporting the sound-proof casing.

4. A machine for breaking concrete or the like comprising a sound-proof casing movable to contact with and enclose an area of the surface being drilled, two or more sealing rings of resilient material on the bottom of the sound-proof casing forming an annular sound absorbing chamber between the bottom of the casing and the surface to be drilled, a percussive tool within the sound-proof casing and operable to drill within the enclosed area and a mobile frame supporting the sound-proof casing.

5. A machine for breaking concrete or the like comprising a sound-proof casing movable to contact with and enclose an area of the surface being drilled, a percussive tool within the sound-proof casing and operable to drill within the enclosed area, a hollow rod through which compressed air is delivered to operate the tool, said rod projecting through the upper end of the sound-proof casing and guiding the tool in movement.

6. A machine for breaking concrete or the like, having double walls with sound absorbing material interposed between the walls of the casing as a whole being movable to contact with and enclose an area of the surface to be drilled, and a percussive tool within the area of the sound absorbing material and operable to drill within the enclosed area.

7. A machine for breaking concrete or the like, comprising a sound-proof casing movable to contact with and enclose an area of the surface being drilled, two or more sealing rings of resilient material on the bottom of the sound-proof casing forming an annular sound absorbing chamber between the bottom of the casing and the surface to be drilled, and a percussive tool within the sound-proof casing and operable to drill within the enclosed area formed by the rings.

8. A machine for breaking concrete or the like, comprising a sound-proof casing movable to contact with and enclose an area of the surface being drilled, a percussive tool within the sound-proof casing and operable to drill within the enclosed area, a hollow rod through which compressed air is delivered to operate the tool, said rod projecting through the upper end of the sound-proof casing and guiding the tool in movement.

9. A machine for breaking concrete or the like comprising a tool having a pick percussively op-
erated by a piston reciprocating in a cylinder, and a soundproof casing closed at its upper end surrounding and extending above and below, the cylinder of the tool, the soundproof casing as a whole being movable to contact with and enclose an area of the surface to be drilled and the tool being movable axially within the soundproof casing to operate the pick within the enclosed area.

10. A machine for breaking concrete or the like comprising a tool having a pick percussively operated by a piston reciprocating in a cylinder, a mobile frame, a soundproof casing closed at its upper end supported by the mobile frame, the soundproof casing surrounding and extending above and below the cylinder of the tool, the soundproof casing as a whole being movable relatively to the mobile frame to contact with and enclose an area of the surface to be drilled and the tool being movable axially within the soundproof casing to operate the pick within the enclosed area.

11. A machine for breaking concrete or the like comprising a tool having a pick percussively operated by a piston reciprocating in a cylinder, a soundproof casing closed at its upper end surrounding and extending above and below the cylinder of the tool, the soundproof casing as a whole being movable to contact with and enclose an area of the surface to be drilled and the tool being movable axially within the soundproof casing to operate the pick within the enclosed area, and seating means surrounding the bottom of the soundproof casing to seal said casing against the surface to be broken.

12. A machine for breaking concrete or the like comprising a tool having a pick percussively operated by means reciprocating in a cylinder, a soundproof casing, closed at its upper end, surrounding and extending above and below the cylinder of the tool, the soundproof casing as a whole being movable to contact with and enclose an area of the surface to be drilled, a cylinder mounted on the top of the soundproof casing, a piston reciprocable in this cylinder and rigidly connected with the cylinder of the tool, and means to supply fluid to the cylinder selectively above and below the piston to lower or raise the tool as a whole relatively to the soundproof casing.

13. A machine for breaking concrete or the like comprising a plurality of tools each having a pick percussively operated by means reciprocating in a cylinder, a plurality of soundproof casings each closed at its upper end and each surrounding and extending above and below the cylinder of a tool, the soundproof casings being movable independently to contact with and enclose an area of the surface to be drilled, means to move the tools axially within the soundproof casings to operate the picks within the enclosed areas, and means for operating the percussive tools simultaneously.

14. A machine for breaking concrete or the like comprising a tool having a pick percussively operated by means reciprocating in a cylinder, a soundproof casing, closed at its upper end, surrounding and extending above and below the cylinder of the tool, a two wheeled truck supporting the soundproof casing, said truck being movable about the line of contact of its wheels with the ground to cause said soundproof casing to contact with and enclose an area of the surface to be drilled, and means for moving the tool axially within the soundproof casing to operate the pick within the enclosed area.

15. A machine for breaking concrete or the like comprising a tool having a pick percussively operated by means reciprocating in a cylinder, a soundproof casing arranged with its axis parallel to the axis of the tool and movable into contact with the surface to be broken, said casing having an opening in the bottom through which the pick can protrude to drill into the surface to be broken and having an opening at the top through which protrudes means for raising or lowering the tool relatively to the casing.

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