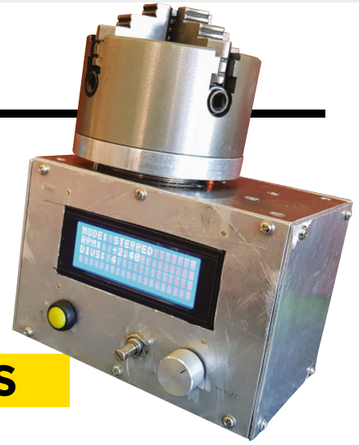
Contents



100

06 SPARK

06 **Top Projects**
The Ferens Gallery of DIY projects

14 **Objet 3d'art**
A 3D-printed concrete construction

18 **Meet the Maker: Brian Lough**
Homemade electronics to scratch an itch

22 **Columns**
How not to get taken for a ride when fixing things

24 **Letters**
Quick! Turn on BBC iPlayer now!

26 **Kickstarting**
The cutest way of checking the surf conditions

28 **Space of the month** STEAMhouse
Innovation in the shadow of the Bullring

32 **Wuthering Bytes**
Open-source learning from the northern hills

35 LENS

36 **Brewing**
The art and science of making your own drinks

56 **How I Made:** WW2 time machine radio
Use a Raspberry Pi to hear messages from the past

62 **In the Workshop:** Raspberry Pi laptop
Hack together a tailor-made computing solution

66 **Interview:** Eben Upton
Pity the man who has no time to build robots…

74 **Improviser's Toolbox** Binder clips
Making things out of little levered metal springs

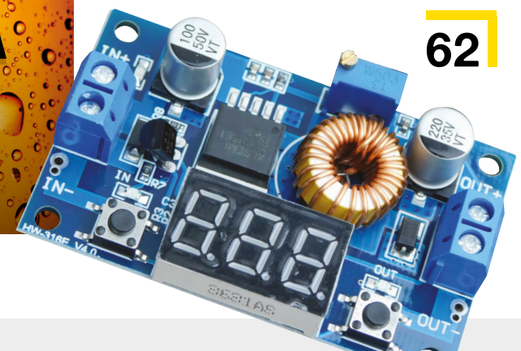
Tutorial

School of making: Arbor press

82 Add extra capabilities to this simple metalworking tool

Cover Feature

36



62

26

Best of Breed

Lidar

116 Find neolithic monuments in villages near you

14

124

Interview

Eben Upton

66 Why manufacturing, like football, is coming home

28

79 FORGE

80 **SoM** LED matrix
Add 64 pixels of output with Arduino or CircuitPython

82 **SoM** Arbor press
Squeeze half a ton of pressure into bearings

88 **Tutorial** Optimise your antennas
Reach the parts other radios cannot reach

94 **Tutorial** Forecast the weather
Build an at-a-glance climate visualiser

98 **Tutorial** Superglue
How not to stick your fingers together

100 **Tutorial** Workshop turntable
Control every angle of your work

104 **Tutorial** FM radio
Build your own programmable radio receiver

106 **Tutorial** 3D-printed jewellery
Design and print in multiple filaments

113 FIELD TEST

114 **Direct from Shenzhen** Bluetooth module
Resurrect old speakers with the power of Bluetooth audio

116 **Best of Breed**
The best lidar scanners for geo-scanning

122 **Can I Hack It?**
Rule your next networking event with a video business card

124 **Review** Tool sharpener
A tiny grinder for your non-essential sharp things

126 **Review** Dremel router attachment
A simple gadget to bring more life to your rotary tool

128 **Review** Template maker
Winter is coming! Prepare with this festive box-designer

129 **Book Review** Booze: River Cottage Handbook
How to make delicious drinks, in book form

Some of the tools and techniques shown in HackSpace Magazine are dangerous unless used with skill, experience and appropriate personal protection equipment. While we attempt to guide the reader, ultimately you are responsible for your own safety and understanding the limits of yourself and your equipment. HackSpace Magazine is intended for an adult audience and some projects may be dangerous for children. Raspberry Pi (Trading) Ltd does not accept responsibility for any injuries, damage to equipment, or costs incurred from projects, tutorials or suggestions in HackSpace Magazine. Laws and regulations covering many of the topics in HackSpace Magazine are different between countries, and are always subject to change. You are responsible for understanding the requirements in your jurisdiction and ensuring that you comply with them. Some manufacturers place limits on the use of their hardware which some projects or suggestions in HackSpace Magazine may go beyond. It is your responsibility to understand the manufacturer's limits.