1

00:00:00,000 --> 00:00:05,000

Please, don't try anything that you're about to see us do at home. Ever!

2

00:00:30,000 --> 00:00:34,000

And then the myth busters put their money where their mouths are.

3

00:00:34,000 --> 00:00:36,000

Kind of reminds me of high school for some reason.

4

00:00:36,000 --> 00:00:42,000

As they sniff out what's got more nutrients, breakfast cereal or the box it comes in.

5

00:00:42,000 --> 00:00:43,000

Smells like poo.

6

00:00:45,000 --> 00:00:48,000

Who are the myth busters? Adam Savage

7

00:00:51,000 --> 00:00:52,000

And Jamie Heineman

8

00:00:52,000 --> 00:00:54,000

This is gonna kill you.

9

00:00:55,000 --> 00:00:59,000

Between them over 30 years special effects experience.

10

00:00:59,000 --> 00:01:01,000

That's what I'm talking about.

11

00:01:01,000 --> 00:01:03,000

Joining them, Tori Belichi

12

00:01:03,000 --> 00:01:05,000

Very excited about this.

13

00:01:05,000 --> 00:01:06,000

Carrie Byron

14

00:01:06,000 --> 00:01:07,000

Look, he cracked into a skull.

15

00:01:07,000 --> 00:01:09,000

And Grant Imahara

16

00:01:09,000 --> 00:01:11,000

Don't say anything.

17

00:01:11,000 --> 00:01:13,000

They don't just tell the myths.

18

00:01:14,000 --> 00:01:16,000

They put them to the test.

19

00:01:23,000 --> 00:01:26,000

First up, a blast from the past.

20

00:01:27,000 --> 00:01:30,000

Archimedes steam cannon.

21

00:01:30,000 --> 00:01:31,000

Yep.

22

00:01:31,000 --> 00:01:39,000

The myth is that Archimedes created a steam cannon around 214 BC to protect the city of Syracuse from a siege.

23

00:01:39,000 --> 00:01:43,000

But didn't it take us like two seasons to bust the last Archimedes myth?

24

00:01:43,000 --> 00:01:44,000

Hey, that's the truth.

25

00:01:44,000 --> 00:01:50,000

The last Archimedes super weapon turned out to be nothing more than smoke and mirrors.

26

00:01:50,000 --> 00:01:55,000

Our death ray doesn't seem to be working. I'm standing right in it.

27

00:01:55,000 --> 00:01:57,000

And I'm not dead yet.

28

00:01:57,000 --> 00:02:05,000

Despite the combined brain power of the mythbusters and MIT, the solar death ray was just hot air.

29

00:02:07,000 --> 00:02:11,000

But now, Archimedes is back with a steam cannon.

30

00:02:11,000 --> 00:02:13,000

So what do we have on this?

31

00:02:13,000 --> 00:02:15,000

Not much.

32

00:02:15,000 --> 00:02:21,000

We've got a one-page drawing and some backwards Italian scribbles from Leonardo da Vinci.

33

00:02:22,000 --> 00:02:24,000

No attribution there about where he got it.

34

00:02:24,000 --> 00:02:26,000

He just mentions Archimedes as the originator.

35

00:02:26,000 --> 00:02:30,000

Then we've got some plans from Greek inventor Sackus.

36

00:02:30,000 --> 00:02:35,000

Well, the Sackus design is just basically a barrel that you heat the back end of.

37

00:02:35,000 --> 00:02:39,000

It looks like it's got some valving on top and a gravity feed for water.

38

00:02:39,000 --> 00:02:43,000

Well, I have to say, looking at these two plans, let's start with the Sackus first,

39

00:02:43,000 --> 00:02:46,000

especially since he built it in a pretty reasonable scale.

40

00:02:46,000 --> 00:02:47,000

Okay.

41

00:02:47,000 --> 00:02:49,000

It all sounds so easy.

42

00:02:49,000 --> 00:02:56,000

Yet somehow, Adam and Jamie have got to copy this code and build some extraordinary ordinance,

43

00:02:56,000 --> 00:03:00,000

a steam cannon that would make Archimedes proud.

44

00:03:01,000 --> 00:03:06,000

But they're going to start by building a proof-of-concept pint-sized pocket rocket.

45

00:03:06,000 --> 00:03:12,000

We're here picking up a variety of copper pipe fittings and sections of pipe

46

00:03:12,000 --> 00:03:18,000

because we're going to assemble all this into a small-scale version of the Archimedes steam cannon.

47

00:03:18,000 --> 00:03:23,000

Back at the shop, Jamie's converting the copper into the propulsion part of the cannon.

48

00:03:23,000 --> 00:03:27,000

It's this piping that will become the steam tank of the tank.

49

00:03:29,000 --> 00:03:34,000

Meanwhile, Adam's concentrating on the business end, and for that, he's got wood.

50

00:03:34,000 --> 00:03:39,000

I'm making the barrel to an Archimedean steam cannon, at least a small-scale one.

51

00:03:40,000 --> 00:03:45,000

But it's not long before Adam's cannon barrel starts taking a turn for the worse.

52

00:03:56,000 --> 00:04:02,000

With a little extra effort and a lot of expletives, Adam finally scrapes the bottom of the barrel.

53

00:04:02,000 --> 00:04:04,000

It fits perfectly.

54

00:04:04,000 --> 00:04:06,000

Look at that.

55

00:04:06,000 --> 00:04:10,000

But when Jamie sees the mess, he's steaming.

56

00:04:10,000 --> 00:04:17,000

Adam, for whatever his other good points, is a pain in the butt to work with.

57

00:04:17,000 --> 00:04:23,000

Not only was he not content to practically destroy about a $30,000 lay,

58

00:04:23,000 --> 00:04:30,000

it apparently was so little affected by that experience that he didn't even bother to clean it up afterwards.

59

00:04:30,000 --> 00:04:34,000

Just, you know, knock me down and then kick me, why don't you?

60

00:04:34,000 --> 00:04:39,000

Adam's antics have made Jamie very hot under the collar, which is rather apt,

61

00:04:39,000 --> 00:04:43,000

because this whole steamy story is about temperature.

62

00:04:44,000 --> 00:04:48,000

When you heat a kettle, the water inside slowly turns into steam.

63

00:04:48,000 --> 00:04:53,000

But if you massively crank up the heat, water can flash to steam in an instant.

64

00:04:53,000 --> 00:04:59,000

This causes a huge increase in pressure, and hey presto, there's a projectile.

65

00:05:00,000 --> 00:05:06,000

That's the theory, but how does this copper contraption put it into practice?

66

00:05:06,000 --> 00:05:10,000

What we have here is a miniature replica of Archimedes steam cannon.

67

00:05:10,000 --> 00:05:15,000

We'll put some water in through this funnel here, retain it in this chamber,

68

00:05:15,000 --> 00:05:20,000

heat this whole thing up to where it's as hot as we can get it, open this valve,

69

00:05:20,000 --> 00:05:24,000

let the water go down in here, a bunch of steam is created instantly.

70

00:05:24,000 --> 00:05:29,000

It pressurizes this whole thing and fires this tennis ball out the end.

71

00:05:29,000 --> 00:05:35,000

Again, it all sounds so easy, but at the Alameda firing station, Adam's not so convinced.

72

00:05:35,000 --> 00:05:40,000

Well, the steam cannon's built and there's nothing left to do on it, but try it out.

73

00:05:40,000 --> 00:05:45,000

You know, we're out here in the open, we're gonna set up a fire, set up the cannon,

74

00:05:45,000 --> 00:05:49,000

see if it does anything besides just blow up.

75

00:05:49,000 --> 00:05:54,000

And blow up it might, so as ever on Mythbusters, safety is paramount.

76

00:05:54,000 --> 00:06:00,000

With the blast shields in place, Jamie ties up a quick release that'll flood the steam tank with water.

77

00:06:00,000 --> 00:06:02,000

That's easiest pie.

78

00:06:02,000 --> 00:06:06,000

Well, there we go. We're ready to heat it up.

79

00:06:06,000 --> 00:06:12,000

Remember they need to get the copper tank so hot that when the water is released into it,

80

00:06:12,000 --> 00:06:18,000

it flashes to steam immediately and propels the tennis ball so it settles out of court.

81

00:06:19,000 --> 00:06:22,000

This is one of those things I have no idea what the outcome could be.

82

00:06:22,000 --> 00:06:26,000

It could fire four feet, we could lose it in the water 500 feet away.

83

00:06:26,000 --> 00:06:31,000

Well, let's find out because it's full steam ahead.

84

00:06:31,000 --> 00:06:37,000

The worst case scenario on this is that the whole thing blows up and is so aggressive

85

00:06:37,000 --> 00:06:42,000

that we're all thrown back a couple hundred feet from the explosion and we die.

86

00:06:42,000 --> 00:06:46,000

Adam might be laughing, but according to his temperature gauge,

87

00:06:46,000 --> 00:06:50,000

this baby bazooka is almost fit to burst.

88

00:06:50,000 --> 00:06:53,000

This is actually kind of dangerous and kind of exciting.

89

00:06:53,000 --> 00:07:00,000

With the tank reading 250 degrees, it's time to release the water into it and hopefully serve up an ace.

90

00:07:00,000 --> 00:07:06,000

And three, two, one.

91

00:07:06,000 --> 00:07:10,000

But that's more of a double fault.

92

00:07:10,000 --> 00:07:12,000

Hey, we're making a hot ball.

93

00:07:12,000 --> 00:07:14,000

So what went wrong?

94

00:07:14,000 --> 00:07:16,000

We don't really know why it failed.

95

00:07:16,000 --> 00:07:17,000

It could be a couple of things.

96

00:07:17,000 --> 00:07:19,000

It could be that there wasn't enough water.

97

00:07:19,000 --> 00:07:22,000

It could be that there wasn't a good enough seal.

98

00:07:22,000 --> 00:07:25,000

It could be that we didn't have enough heat.

99

00:07:25,000 --> 00:07:29,000

So for test two, they're looking at three alterations.

100

00:07:29,000 --> 00:07:34,000

First, they cover the tennis ball in cloth and grease to ensure a tight fit in the barrel.

101

00:07:34,000 --> 00:07:36,000

That's a tight seal.

102

00:07:36,000 --> 00:07:39,000

Then they add more water.

103

00:07:39,000 --> 00:07:46,000

And most importantly, they then bring her to boil with twice as many propane heaters to ramp up the temperature.

104

00:07:46,000 --> 00:07:49,000

I'm getting around 400 degrees.

105

00:07:49,000 --> 00:07:54,000

Surely 400 degrees will be hot enough to flash the water to steam.

106

00:07:54,000 --> 00:07:57,000

Cover your ears. Here comes test two.

107

00:07:57,000 --> 00:08:02,000

Three, two, one.

108

00:08:02,000 --> 00:08:04,000

Oh.

109

00:08:04,000 --> 00:08:08,000

Now what do we do?

110

00:08:08,000 --> 00:08:13,000

We didn't get the luscious poof that we wanted.

111

00:08:13,000 --> 00:08:17,000

400 degrees just ain't enough to get a luscious poof.

112

00:08:17,000 --> 00:08:23,000

For that, in the third and final test, they need the tank to be even hotter.

113

00:08:23,000 --> 00:08:26,000

Oh, it's climbing pretty rapidly this time.

114

00:08:26,000 --> 00:08:30,000

This time, the burners peak at a whopping 500 degrees.

115

00:08:30,000 --> 00:08:33,000

That's definitely the hottest we've seen it so far.

116

00:08:33,000 --> 00:08:35,000

Will the tennis ball finally go ballistic?

117

00:08:35,000 --> 00:08:40,000

And three, two, one.

118

00:08:40,000 --> 00:08:48,000

And no, after three failures, it's looking like game and set to the myth, but the match ain't over yet.

119

00:08:48,000 --> 00:08:53,000

Later, the colossal cannon kicks off.

120

00:08:53,000 --> 00:08:55,000

Booze!

121

00:08:55,000 --> 00:08:59,000

But after the break, breakfast with a difference.

122

00:08:59,000 --> 00:09:01,000

Yummy.

123

00:09:06,000 --> 00:09:16,000

Canons propelled by gunpowder with a mainstay of any armada's arsenal from as early as the 15th century.

124

00:09:16,000 --> 00:09:23,000

But did the great Archimedes invent a cannon powered by steam almost 2,000 years earlier?

125

00:09:23,000 --> 00:09:26,000

Well, not if the myth musters are anything to go by.

126

00:09:26,000 --> 00:09:31,000

They just couldn't get their copper cannon hot enough to result in a boom.

127

00:09:31,000 --> 00:09:33,000

One.

128

00:09:36,000 --> 00:09:42,000

With this steamy story boiling towards busted, the team calls in the cavalry.

129

00:09:42,000 --> 00:09:44,000

Welcome to M5.

130

00:09:44,000 --> 00:09:50,000

Roger McCarthy investigates engineering disasters, so he should be ideal for this myth.

131

00:09:50,000 --> 00:09:53,000

And he brings good news about steam.

132

00:09:53,000 --> 00:10:01,000

All high explosive is, is a material that changes from solid to gas very rapidly.

133

00:10:01,000 --> 00:10:08,000

You're taking solid water, and you're using heat to instantly flash it to gas.

134

00:10:08,000 --> 00:10:12,000

I mean, it sounds like you're actually pretty optimistic that we could get this to work and work very effectively.

135

00:10:12,000 --> 00:10:19,000

There is no question that if we engineered this properly, it would shoot a projectile, and so the question is, how many yards?

136

00:10:19,000 --> 00:10:23,000

Personally, I think we'd be totally delighted with just a few hundred feet.

137

00:10:23,000 --> 00:10:25,000

Proof of concept here.

138

00:10:25,000 --> 00:10:27,000

Speak for yourself.

139

00:10:27,000 --> 00:10:35,000

Largely thanks to Roger, the boys come up with four design changes that may just make this cannon hit paydirt.

140

00:10:35,000 --> 00:10:39,000

First, they'll add more water through a thicker pipe.

141

00:10:39,000 --> 00:10:46,000

Second, they'll put in a specially drilled tube that will drip the water onto all parts of the hot

tank.

142

00:10:46,000 --> 00:10:52,000

Third, they'll throw in a bunch of copper nails to try to increase the hot surface area.

143

00:10:52,000 --> 00:10:56,000

And lastly, they'll crank the temperature up to the max.

144

00:10:56,000 --> 00:11:03,000

That's Roger's remedy, but it's down to Jamie to build it, starting with the new water inlet.

145

00:11:03,000 --> 00:11:05,000

You go.

146

00:11:05,000 --> 00:11:07,000

Can't beat that.

147

00:11:07,000 --> 00:11:08,000

You can't beat that.

148

00:11:08,000 --> 00:11:11,000

Then it's the new distribution pipe.

149

00:11:11,000 --> 00:11:17,000

With that nailed, that just leaves the nails, and she's almost ready.

150

00:11:17,000 --> 00:11:25,000

I'm going to put the ball in first, then I'm going to clear out, you're going to put the water in, and you'll clear out and we'll launch it.

151

00:11:26,000 --> 00:11:34,000

As well as the new additions to the cannon, they're maximizing their chance of a steam flash by heating the copper with a blow torch.

152

00:11:34,000 --> 00:11:37,000

We're at about 500 degrees there.

153

00:11:37,000 --> 00:11:41,000

Syracuse beware, this cannon's ready to blow.

154

00:11:41,000 --> 00:11:43,000

Oh dude, let's go.

155

00:11:43,000 --> 00:11:46,000

Three, two, one, fire.

156

00:11:47,000 --> 00:11:57,000

Well, it fired.

157

00:11:57,000 --> 00:11:59,000

It did, it did, it fired.

158

00:11:59,000 --> 00:12:02,000

It wasn't very deadly, but it definitely fired.

159

00:12:02,000 --> 00:12:05,000

Jamie, that was the cutest little cannon I have ever seen.

160

00:12:05,000 --> 00:12:10,000

Cute, yes, deadly, not unless the opposing army died laughing.

161

00:12:10,000 --> 00:12:15,000

But Jamie has found proof that this was actually a success.

162

00:12:15,000 --> 00:12:17,000

Oh my god.

163

00:12:17,000 --> 00:12:22,000

I think there is a reason that this thing wasn't firing as energetically.

164

00:12:22,000 --> 00:12:27,000

No, I think we have as a reason why the Greeks didn't use tennis balls.

165

00:12:27,000 --> 00:12:34,000

The heat melted the tennis ball out of shape, so much of the steam pressure escaped around it.

166

00:12:34,000 --> 00:12:40,000

Remarkably, it's mission accomplished, so it's time to unleash the big guns.

167

00:12:40,000 --> 00:12:42,000

Look, we've got a proof of concept. I want to move on.

168

00:12:42,000 --> 00:12:45,000

Yeah, I'm tired of these little things.

169

00:12:54,000 --> 00:13:00,000

So picture me, little child, sitting in my mom's grocery cart being pushed through the aisles, looking for cereal.

170

00:13:00,000 --> 00:13:07,000

I'd like point at the box of super sugar hyperpop or something like that, and she says, like all mothers say,

171

00:13:07,000 --> 00:13:12,000

no, you can't have that cereal because the box has more nutritional value than the food.

172

00:13:12,000 --> 00:13:17,000

Well, like beavers eat wood, that's sort of a wood product.

173

00:13:17,000 --> 00:13:19,000

Do I look like a beaver to you?

174

00:13:19,000 --> 00:13:21,000

Sometimes.

175

00:13:22,000 --> 00:13:26,000

Well, actually more like a ginger gopher.

176

00:13:28,000 --> 00:13:35,000

But beavers and other rodents aside, Adam's mom is not alone in believing this myth of calorific chaos.

177

00:13:35,000 --> 00:13:42,000

Big puffs of wheat tumble through hot sugar and honey until they're deliciously, delightfully crisp.

178

00:13:42,000 --> 00:13:46,000

But is it the cereal or the box that keeps you sweet?

179

00:13:46,000 --> 00:13:50,000

Have the cereal just sweet enough for the whole family.

180

00:13:50,000 --> 00:13:52,000

How do we test it?

181

00:13:52,000 --> 00:13:58,000

Well, you know, eventually one of us is going to have to eat a lot of cardboard, like you had to do in the South Pacific that time.

182

00:13:58,000 --> 00:14:01,000

And the other is going to have to eat a lot of sugary cereal.

183

00:14:01,000 --> 00:14:05,000

But for starters, we should just figure out what the caloric content of each is.

184

00:14:05,000 --> 00:14:10,000

Run this through a test with a calorimeter and run this stuff and find out how many calories you'll get out of them.

185

00:14:18,000 --> 00:14:19,000

Yummy.

186

00:14:19,000 --> 00:14:25,000

To make the cereal box more palatable, Jamie's whisking it up into a cardboard smoothie.

187

00:14:25,000 --> 00:14:28,000

Kind of reminds me of high school for some reason.

188

00:14:28,000 --> 00:14:35,000

Ah, Jamie's school days. Practicing football, growing facial hair and drinking cardboard.

189

00:14:35,000 --> 00:14:40,000

But his recipe gets stranger still as he turns it into pellets.

190

00:14:40,000 --> 00:14:41,000

Jamie.

191

00:14:41,000 --> 00:14:42,000

Yeah.

192

00:14:42,000 --> 00:14:47,000

Wow. Are you replicating the intestines of some small furry animal?

193

00:14:47,000 --> 00:14:48,000

I have some.

194

00:14:48,000 --> 00:14:49,000

Have you tried it?

195

00:14:49,000 --> 00:14:50,000

Yeah.

196

00:14:51,000 --> 00:14:57,000

You know, it tastes uncannily like cardboard.

197

00:14:57,000 --> 00:15:06,000

As Jamie prepares more of next week's dinner, Grant's helping Adam with something much more energetic.

198

00:15:06,000 --> 00:15:10,000

As it turns out, there is a way to tell how much energy is contained in a food.

199

00:15:10,000 --> 00:15:12,000

And that's by using a calorimeter.

200

00:15:12,000 --> 00:15:19,000

These can get pretty complicated, but I think we should be able to find or make something that's pretty simple that will help us.

201

00:15:19,000 --> 00:15:22,000

Simple. That will get us in the ballpark.

202

00:15:22,000 --> 00:15:27,000

One internet order later, and Adam's all set to get right in that ballpark.

203

00:15:27,000 --> 00:15:28,000

That'll help.

204

00:15:28,000 --> 00:15:32,000

But exactly how does this calorimeter work?

205

00:15:32,000 --> 00:15:35,000

I burn it underneath a pot full of water.

206

00:15:35,000 --> 00:15:40,000

If I know exactly how much water I have and what temperature it was when I began burning the food,

207

00:15:40,000 --> 00:15:47,000

by the time it's all done burning, I measure the temperature and that tells me with an equation what the caloric content of that food was.

208

00:15:47,000 --> 00:15:54,000

To check it's all working, Adam's going to run a test with some candy whose calorific content he already knows.

209

00:15:54,000 --> 00:15:57,000

I've got 100 milliliters of water.

210

00:15:57,000 --> 00:16:05,000

I've got my candy, which I know to be 80 calories of candy right here, and I'm hoping when I burn it,

211

00:16:05,000 --> 00:16:10,000

that my figures show roughly 80 calories of energy expended.

212

00:16:10,000 --> 00:16:14,000

That's the theory, but there's a technical hitch.

213

00:16:15,000 --> 00:16:19,000

Wow, this is no good. I can't get the candy lit.

214

00:16:19,000 --> 00:16:24,000

The candy just won't catch fire, which means Adam can't calibrate his calorimeter.

215

00:16:24,000 --> 00:16:26,000

I'm going to move on to something else.

216

00:16:26,000 --> 00:16:30,000

Putting together a calorimeter is the work of a couple of minutes.

217

00:16:30,000 --> 00:16:35,000

Making it work? A lifetime.

218

00:16:35,000 --> 00:16:41,000

So far, it's hardly a ripped snort in success, but Adam's going to plow on regardless,

219

00:16:41,000 --> 00:16:45,000

starting with his mom's nemesis, a commonly available cereal.

220

00:16:45,000 --> 00:16:46,000

Look at that.

221

00:16:46,000 --> 00:16:49,000

And remarkably, it works.

222

00:16:49,000 --> 00:16:56,000

Adam's lit exactly one gram of the breakfast booty, and it's slowly heating 100 mils of water.

223

00:16:57,000 --> 00:17:01,000

And we're out.

224

00:17:01,000 --> 00:17:07,000

I'm going to start reading the temperature now, even though it's going to take a couple minutes to reach the full temperature.

225

00:17:08,000 --> 00:17:14,000

The water temperature went up by 10 degrees, which after some complex calculations,

226

00:17:14,000 --> 00:17:18,000

means that one gram of cereal equals nine calories.

227

00:17:18,000 --> 00:17:23,000

Can the regular run-of-the-mill cereal box do any better?

228

00:17:23,000 --> 00:17:25,000

Smells like poo.

229

00:17:25,000 --> 00:17:33,000

Well, no. After it's burnt completely, Adam does more sums to find that the box has 20% less energy than the cereal.

230

00:17:33,000 --> 00:17:36,000

So what does that mean for Adam's mom?

231

00:17:36,000 --> 00:17:41,000

At this point, mom is wrong, but mom got a lot closer than I would have pegged.

232

00:17:41,000 --> 00:17:47,000

I wouldn't have thought that the cardboard box would show only 20% less calories than the cereal.

233

00:17:47,000 --> 00:17:54,000

With the scales tipped in favor of the cereal, it's time to start banqueting on box.

234

00:17:55,000 --> 00:18:00,000

Coming up on MythBusters, the steam cannon spirals out of control.

235

00:18:00,000 --> 00:18:03,000

But I gotta say, it's pretty exciting. It's almost too exciting.

236

00:18:07,000 --> 00:18:12,000

Steam power is not to be sniffed at.

237

00:18:12,000 --> 00:18:17,000

After all, it's what fueled the great locomotives of the Industrial Revolution.

238

00:18:17,000 --> 00:18:23,000

But over 2,000 years earlier, did our comedies use steam to power a cannon?

239

00:18:24,000 --> 00:18:30,000

Well, the MythBusters small-scale steam cannon may have looked more comic than killer,

240

00:18:30,000 --> 00:18:39,000

but as proof of concept, this was a success. So here comes the big guns.

241

00:18:39,000 --> 00:18:42,000

Well, Adam, I think it's time we go full-scale with this one.

242

00:18:42,000 --> 00:18:45,000

Look, I think if we build this, we should do something a little different with this myth

243

00:18:45,000 --> 00:18:48,000

and not limit ourselves to period materials here.

244

00:18:48,000 --> 00:18:55,000

We should go with modern materials and go with the best technology we can apply to illustrating the principle of Leonardo's design.

245

00:18:55,000 --> 00:18:59,000

If we can't do it with everything that we have, there's no way Leonardo could have done it

246

00:18:59,000 --> 00:19:02,000

and there's no way in hell our comedies could have used this.

247

00:19:02,000 --> 00:19:03,000

I agree.

248

00:19:03,000 --> 00:19:09,000

Da Vinci's colossal cannon consists of a barrel which is heated in a brazier until it's so hot

249

00:19:09,000 --> 00:19:15,000

that a sudden injection of water explodes to steam and fires out a projector.

250

00:19:15,000 --> 00:19:21,000

It's a simple design, but the tricky part is going to be finding a big enough barrel.

251

00:19:21,000 --> 00:19:24,000

But, uh, this should do.

252

00:19:24,000 --> 00:19:31,000

The barrel of the steam cannon is going to be a 20-foot-long, 6-inch, schedule-80 pipe.

253

00:19:31,000 --> 00:19:37,000

The barrel's the size of a Second World War howitzer, but is it big enough?

254

00:19:37,000 --> 00:19:46,000

After all, the Mythbusters want to fire this, a 24-pound cast-iron Civil War cannonball.

255

00:19:46,000 --> 00:19:49,000

A wager doesn't fit.

256

00:19:49,000 --> 00:19:52,000

I'd say that's a perfect fit.

257

00:19:52,000 --> 00:19:54,000

Hold on. Oh, oh, oh, wait, wait, wait.

258

00:19:54,000 --> 00:19:57,000

Ah! That was scary.

259

00:19:57,000 --> 00:20:04,000

With a fit this perfect, the Mythbusters can't help but celebrate with a game of howitzer handball.

260

00:20:04,000 --> 00:20:08,000

I'm not a bad old warfare sucked.

261

00:20:08,000 --> 00:20:12,000

The race is on to get this build firing.

262

00:20:12,000 --> 00:20:17,000

And first, Adam sets to work on the coal-fired brazier.

263

00:20:17,000 --> 00:20:22,000

Then I've got a thermocouple, which is actually a kiln thermometer.

264

00:20:22,000 --> 00:20:28,000

I want to know exactly when this barrel reaches about 900 degrees.

265

00:20:28,000 --> 00:20:34,000

900 degrees should be enough to get the water to flash to steam, but how to get the water in?

266

00:20:34,000 --> 00:20:39,000

This is intended to simply be an air actuator, a piston.

267

00:20:39,000 --> 00:20:46,000

We're going to put water in one side, and then put air in there and push the water out the other side.

268

00:20:47,000 --> 00:20:54,000

Jamie's precious pressure system should inject the water in less than 30 milliseconds.

269

00:20:57,000 --> 00:21:03,000

With the water injector up and running, the final step is pure retro.

270

00:21:03,000 --> 00:21:08,000

Ooh, ooh, look at these.

271

00:21:08,000 --> 00:21:11,000

Oh, that's beautiful.

272

00:21:11,000 --> 00:21:16,000

There's no need to reinvent the wheel because these are straight from the Civil War.

273

00:21:16,000 --> 00:21:19,000

They're the real deal.

274

00:21:19,000 --> 00:21:23,000

At last, everything's set to introduce the brazier to the barrel.

275

00:21:23,000 --> 00:21:30,000

And the mythbusters are packing the world's first working Leonardo da Vinci steam cannon.

276

00:21:36,000 --> 00:21:38,000

That is so satisfying.

277

00:21:38,000 --> 00:21:42,000

And like all boys with their toys, they're pretty damn excited about it.

278

00:21:42,000 --> 00:21:43,000

Bows!

279

00:21:43,000 --> 00:21:44,000

Psst!

280

00:21:44,000 --> 00:21:45,000

Boom!

281

00:21:45,000 --> 00:21:51,000

I'm having some pride issues here.

282

00:21:51,000 --> 00:21:54,520

I can't wait to see how much power this thing has.

283

00:21:54,520 --> 00:22:04,640

But before any power propulsions, the Mythbusters first hit the history books.

284

00:22:04,640 --> 00:22:07,320

What kind of historical evidence do we have to support this myth?

285

00:22:07,320 --> 00:22:10,320

A precious little, but we came across these two.

286

00:22:10,320 --> 00:22:14,160

One in Petrarch's Remedies for Fortune, Fair and Foul.

287

00:22:14,160 --> 00:22:19,560

We have what used to be thrust forth by the clouds of heaven is now being thrust forth

288

00:22:19,560 --> 00:22:22,640

by a machine conceived in hell.

289

00:22:22,640 --> 00:22:29,520

And then we had Valterio's Dere military translated at great expense and came up with this.

290

00:22:29,520 --> 00:22:34,800

The Canon, or Bombarda as it's commonly called, is a contrivance made of metal which, through

291

00:22:34,800 --> 00:22:40,960

the agency of flame and esulfurus, or perhaps one should say hellish, powder, pearls, bronze,

292

00:22:40,960 --> 00:22:41,960

missiles.

293

00:22:41,960 --> 00:22:46,720

You'll notice in neither of these references the mention of the word steam.

294

00:22:46,720 --> 00:22:51,600

The history books may not be steamy novels, but the Mythbusters are ready to see if their

295

00:22:51,600 --> 00:22:55,440

Canon colossus can make Archimedes proud.

296

00:22:55,440 --> 00:22:57,360

I gotta say it's pretty exciting.

297

00:22:57,360 --> 00:23:00,720

It's almost too exciting.

298

00:23:00,720 --> 00:23:05,440

You know, we've made this big thing that nobody's ever seen before.

299

00:23:05,440 --> 00:23:09,600

Apparently there's a lot of potential in this thing and it's big.

300

00:23:09,600 --> 00:23:12,920

So if it works, it's gonna be really dramatic.

301

00:23:12,920 --> 00:23:20,360

With the Canon locked and loaded.

302

00:23:20,360 --> 00:23:22,280

Was that the coolest sound ever?

303

00:23:22,280 --> 00:23:24,320

They aim her down the runway.

304

00:23:24,320 --> 00:23:26,440

That looks pretty good.

305

00:23:26,760 --> 00:23:31,120

Then make sure there's fire in the hole.

306

00:23:31,120 --> 00:23:35,560

Last up, they put a sock on the end of the barrel to help them locate the fired ball

307

00:23:35,560 --> 00:23:41,320

because Da Vinci reckoned this thing could fire over 3,000 feet.

308

00:23:41,320 --> 00:23:44,400

The vibe right now is that this thing is gonna work.

309

00:23:44,400 --> 00:23:45,640

We're all a little giddy.

310

00:23:45,640 --> 00:23:51,000

I give a 20% chance that absolutely nothing will happen when we push the launch button.

311

00:23:51,000 --> 00:23:55,880

I give a 70% chance of success.

312

00:23:55,880 --> 00:23:59,160

That is, the ball leaving the end of this barrel.

313

00:23:59,160 --> 00:24:03,880

And I'm only gonna give a 10% chance that we actually find that ball.

314

00:24:03,880 --> 00:24:09,720

But launch will only take place when the Canon is so hot that all the water injected in through

315

00:24:09,720 --> 00:24:13,920

the actuators will flash to steam in an instant.

316

00:24:13,920 --> 00:24:17,200

And 1,000 degrees should be hot enough.

317

00:24:17,200 --> 00:24:19,680

Okay, let's get out of here.

318

00:24:19,680 --> 00:24:20,800

Clear the decks.

319

00:24:20,800 --> 00:24:23,800

This mother is about to get fired.

320

00:24:23,800 --> 00:24:24,800

I think it's time.

321

00:24:24,800 --> 00:24:26,800

Give it a countdown.

322

00:24:26,800 --> 00:24:30,800

Three, two, one.

323

00:24:32,800 --> 00:24:38,560

Well, that hardly knocked their socks off.

324

00:24:38,560 --> 00:24:40,720

The water definitely got injected.

325

00:24:40,720 --> 00:24:42,360

So what went wrong?

326

00:24:42,360 --> 00:24:45,760

Well, on closer inspection, there's your problem.

327

00:24:45,760 --> 00:24:48,240

Adam, what do you see?

328

00:24:48,240 --> 00:24:49,240

It's steamed.

329

00:24:49,240 --> 00:24:51,120

Look at the water dripping off.

330

00:24:51,120 --> 00:24:56,280

The inside of the barrel simply wasn't hot enough to get that instantaneous flash.

331

00:24:56,280 --> 00:24:58,480

So they're going to up the end.

332

00:24:58,480 --> 00:25:02,120

Well, we've got it now at like 1500 degrees.

333

00:25:02,120 --> 00:25:03,640

That's what the thermocouple is reading.

334

00:25:03,640 --> 00:25:06,040

Well, I think we just want to stoke this fire.

335

00:25:06,040 --> 00:25:07,560

Stoke it, stoke it, stoke it, stoke it, stoke it.

336

00:25:07,560 --> 00:25:11,800

Get it super, super hot, and then we go and then we'll get a result.

337

00:25:11,800 --> 00:25:12,800

I'm wired.

338

00:25:12,800 --> 00:25:13,800

I'm totally wired.

339

00:25:13,800 --> 00:25:17,040

Trying to figure out what's going on inside of very hot, very dangerous things.

340

00:25:17,040 --> 00:25:19,160

It's nerve-racking.

341

00:25:19,160 --> 00:25:24,320

It sure is bad for the nerves because at these temperatures, the very structural integrity

342

00:25:24,320 --> 00:25:26,520

of the barrel is in jeopardy.

343

00:25:26,520 --> 00:25:28,280

That's a glowing barrel.

344

00:25:28,280 --> 00:25:31,000

We're good for test number two.

345

00:25:31,000 --> 00:25:33,000

Give it a countdown, Jamie.

346

00:25:33,000 --> 00:25:34,000

Okay.

347

00:25:34,000 --> 00:25:36,000

Three, two, one.

348

00:25:36,000 --> 00:25:37,000

Oh.

349

00:25:37,000 --> 00:25:39,000

That looked a little terrible.

350

00:25:39,000 --> 00:25:45,560

I want this thing to work.

351

00:25:45,560 --> 00:25:47,680

I don't know what could have happened there.

352

00:25:47,680 --> 00:25:53,480

I don't want to talk about it.

353

00:25:53,480 --> 00:25:58,040

Playback shows the piping leaking significantly because of the heat.

354

00:25:58,040 --> 00:26:03,760

If these modern materials can't cope, then how could the ancient Greeks?

355

00:26:03,760 --> 00:26:08,360

With the light fading, Adam welds over the leaks and adds more coals.

356

00:26:08,360 --> 00:26:12,960

Then as a last-ditch effort, they decrease the angle of the barrel to make it easier

357

00:26:12,960 --> 00:26:15,960

for the cannonball to fire.

358

00:26:15,960 --> 00:26:21,520

Three, two, one.

359

00:26:21,520 --> 00:26:22,520

Wait for it.

360

00:26:22,520 --> 00:26:28,080

There went the ball.

361

00:26:28,080 --> 00:26:34,120

It's yet another Mythbusters ball zone, which leaves this myth dribbling towards Boston.

362

00:26:34,120 --> 00:26:40,360

I was hoping that it would actually work, but all we have to show for it is a nice warm

363

00:26:40,360 --> 00:26:41,360

ball.

364

00:26:42,120 --> 00:26:46,560

Later, the pressure of the steam cannon gets to Jamie.

365

00:26:46,560 --> 00:26:51,000

But on the other side of the break, the serial conundrum gets solved.

366

00:26:51,000 --> 00:26:53,000

Oh, that's lovely.

367

00:26:53,000 --> 00:26:56,960

It's like a sugary mash.

368

00:26:56,960 --> 00:27:01,600

Remember, don't try this at home.

369

00:27:01,600 --> 00:27:04,800

We've got years of experience that keeps us safe.

370

00:27:04,800 --> 00:27:18,560

Adam and Jamie are investigating some morning mayhem from Adam's mom.

371

00:27:18,560 --> 00:27:28,240

She reckons that the box the serial comes in is more nutritious than the serial itself.

372

00:27:28,240 --> 00:27:33,160

But so far, Adam's mom is not doing well.

373

00:27:33,160 --> 00:27:39,480

In the calorimeter energy test, Adam's just found that the box contains 20% fewer calories

374

00:27:39,480 --> 00:27:40,480

than the serial.

375

00:27:40,480 --> 00:27:46,880

Next, let's look at what the serial box and the serial are actually comprised of, what

376

00:27:46,880 --> 00:27:51,720

kind of proteins, fats, amino acids, whatever might be in them.

377

00:27:51,720 --> 00:27:58,400

We need to actually break them down and see what in there might be available to the body.

378

00:27:58,400 --> 00:28:04,200

To do this nutrition test, an eating competition had beckoned for the mythbusters.

379

00:28:04,200 --> 00:28:10,560

But with low calorie serial box on the menu for one of them, it seems they've turned chicken.

380

00:28:10,560 --> 00:28:14,360

My original plan was that you'd eat cardboard for a week and I'd eat some sugary cereal

381

00:28:14,360 --> 00:28:15,360

for a week.

382

00:28:15,360 --> 00:28:17,920

It seems kind of ideal for both of us.

383

00:28:17,920 --> 00:28:20,960

But I think we'd both cheat.

384

00:28:20,960 --> 00:28:24,560

I think, I know you'd cheat, and I'm pretty sure that I would end up cheating too.

385

00:28:24,560 --> 00:28:29,840

Well, not only that, but I'm actually not just concerned about the nutritional value

386

00:28:29,840 --> 00:28:34,960

of the cardboard, but the other things that are in there as well, like things that I wouldn't

387

00:28:34,960 --> 00:28:40,040

want, maybe from the ink or something like that, that might be bad for you.

388

00:28:40,040 --> 00:28:42,920

So the human lab rat experiment is canned.

389

00:28:42,920 --> 00:28:46,520

Jamie was scared by potential toxins in the cardboard.

390

00:28:46,520 --> 00:28:49,160

Adam, by the chance Jamie, would cheat.

391

00:28:49,160 --> 00:28:53,600

So instead, they're going to do something more scientific.

392

00:28:53,600 --> 00:28:56,880

No longer are they going to be guinea pigs, but chemists.

393

00:28:56,880 --> 00:29:02,040

It may not look like much, but it's science.

394

00:29:02,040 --> 00:29:08,160

They're going to test the cereal and the box for fat, protein, starch and sugars.

395

00:29:08,160 --> 00:29:10,480

Oh, that's lovely.

396

00:29:10,480 --> 00:29:15,120

It's like a sugary mash.

397

00:29:15,120 --> 00:29:20,600

And for each test, they've got a control to see what a positive result looks like.

398

00:29:20,600 --> 00:29:23,520

First up, they're probing the fat content.

399

00:29:23,520 --> 00:29:28,720

And this one, all we do is dip a test strip into each of the liquids for five seconds.

400

00:29:28,720 --> 00:29:32,720

Starting with the control, some fat-rich olive oil.

401

00:29:32,720 --> 00:29:35,920

A positive test will turn the pad deep red.

402

00:29:35,920 --> 00:29:37,760

So that's a positive test for lipids.

403

00:29:37,760 --> 00:29:40,120

Okay, so our control is good.

404

00:29:40,120 --> 00:29:41,800

Next up, the cardboard box.

405

00:29:41,800 --> 00:29:45,840

It doesn't seem that there's any fat in the cardboard.

406

00:29:45,840 --> 00:29:50,040

So remember this, kids, cardboard is low in fat.

407

00:29:50,080 --> 00:29:53,600

With the cereal, there is a hint of red to the dipstick.

408

00:29:53,600 --> 00:29:54,880

So there's a bit of fat in the cereal.

409

00:29:54,880 --> 00:29:55,720

A little bit.

410

00:29:55,720 --> 00:29:56,880

Cereal?

411

00:29:56,880 --> 00:29:59,120

It's one zero to the cereal.

412

00:29:59,120 --> 00:30:01,760

Okay, starches.

413

00:30:01,760 --> 00:30:06,760

In the iodine starch test, the control gives a positive dark blue hue,

414

00:30:06,760 --> 00:30:09,840

a color slightly replicated by the cardboard,

415

00:30:09,840 --> 00:30:13,480

but much more so by the starchy breakfast bites.

416

00:30:13,480 --> 00:30:18,000

Oh yeah, cereal, positive, lots.

417

00:30:18,000 --> 00:30:18,600

Yeah.

418

00:30:18,600 --> 00:30:21,560

Meaning it's two zero to the cereal.

419

00:30:21,560 --> 00:30:23,240

Next up, the sugar test.

420

00:30:23,240 --> 00:30:27,080

And this one requires a bit of microwave action.

421

00:30:27,080 --> 00:30:29,080

What the hell is going on in here?

422

00:30:29,080 --> 00:30:31,360

Here's the original stuff with cardboard in it,

423

00:30:31,360 --> 00:30:34,120

and it looks exactly the same color as it did.

424

00:30:34,120 --> 00:30:39,040

This is the cereal, and if it has a greenish tinge or a yellowish tinge,

425

00:30:39,040 --> 00:30:41,000

it indicates the presence of sugars.

426

00:30:41,000 --> 00:30:47,080

Finally, the protein test makes it a myth-busting four zero to the cereal.

427

00:30:47,080 --> 00:30:49,400

So there's no protein in the cardboard.

428

00:30:49,400 --> 00:30:54,080

And to check all their results, Adam looks at the box information.

429

00:30:54,080 --> 00:30:57,200

Why didn't we just look at the darn box in the first place?

430

00:30:57,200 --> 00:31:00,160

The reason we have to do this is because while it does give you

431

00:31:00,160 --> 00:31:03,840

some of the values of the nutrients in the cereal,

432

00:31:03,840 --> 00:31:07,840

they have neglected to put any of the values of the nutrients in the cardboard box.

433

00:31:07,840 --> 00:31:12,320

You mean they actually don't intend that we eat the box?

434

00:31:12,320 --> 00:31:14,800

Da da da!

435

00:31:14,840 --> 00:31:20,600

After some sugar-induced silliness, it's time to wrap this one up.

436

00:31:20,600 --> 00:31:26,280

Well, breakfast cereal versus the cardboard box it comes in, what are our results?

437

00:31:26,280 --> 00:31:29,760

Well, on the calorimeter test, the breakfast cereal won.

438

00:31:29,760 --> 00:31:33,200

It had 22% more calories than the cardboard box.

439

00:31:33,200 --> 00:31:36,280

What about testing for specific nutrients?

440

00:31:36,280 --> 00:31:40,400

A cereal won hands down in that test as well.

441

00:31:40,400 --> 00:31:44,480

Mom, I'm sorry, but you were totally wrong.

442

00:31:44,480 --> 00:31:46,000

That's completely busted.

443

00:31:50,000 --> 00:31:51,600

Stay with us.

444

00:31:53,600 --> 00:31:57,040

As the steam cannon takes two, strikes gold.

445

00:31:58,040 --> 00:32:02,800

Dude! That is so cool!

446

00:32:09,200 --> 00:32:14,240

In the myth of the Archimedes steam cannon, Adam and Jamie rolled out a barrel bigger

447

00:32:14,240 --> 00:32:16,200

than a Vietnam howitzer.

448

00:32:16,200 --> 00:32:22,920

But size is where the comparison ends, because their cannon was about as dangerous as a frisbee.

449

00:32:22,920 --> 00:32:25,400

I don't know about you, but I'd call this myth busted.

450

00:32:25,400 --> 00:32:29,880

Without a doubt, we threw everything we could at this, from high-speed injectors

451

00:32:29,880 --> 00:32:36,320

to modern materials to the best advice we could get, and we met all of the conditions

452

00:32:36,320 --> 00:32:39,760

that we were told to get, including getting the back of that barrel red hot,

453

00:32:39,760 --> 00:32:43,040

getting the exact amount of water we should have gotten in, and we didn't get a launch.

454

00:32:43,040 --> 00:32:45,040

It's totally busted.

455

00:32:45,040 --> 00:32:50,560

Well, you know, seeing that ball kind of come rolling lazily out the end of the barrel

456

00:32:50,560 --> 00:32:51,680

didn't quite do it for me.

457

00:32:51,680 --> 00:32:55,560

I think we have to actually launch the ball somehow, and that would mean that we have

458

00:32:55,560 --> 00:32:59,000

to build a proper boiler with a valve on it.

459

00:32:59,000 --> 00:33:05,040

I'm going to build a small-scale one that I guarantee will actually fire a cannon ball

460

00:33:05,040 --> 00:33:07,400

just so we have some kind of explosion out of this.

461

00:33:08,720 --> 00:33:12,080

The mythbusters can't leave this myth without a bang.

462

00:33:12,080 --> 00:33:16,280

And with Leonardo's design busted, Adam's got a plan B.

463

00:33:17,280 --> 00:33:22,480

Their last cannon relied on water being added and flashing the steam instantly.

464

00:33:22,480 --> 00:33:27,880

This time, thanks to a heavy-duty valve, they'll heat the water inside the chamber

465

00:33:27,880 --> 00:33:34,760

until the steam pressure is such that when the valve is open, the results are explosive.

466

00:33:34,760 --> 00:33:45,040

And to open the pressure valve fast enough, Adam's using those pneumatic actuators again.

467

00:33:45,040 --> 00:33:49,920

The only thing strong enough to do it fast, it would take me about a full, like, two seconds

468

00:33:49,920 --> 00:33:50,920

to pull it.

469

00:33:50,920 --> 00:33:53,280

This does it in about a quarter of that time.

470

00:33:53,280 --> 00:33:57,880

That should be fast enough to give it the oomph that their earlier, more authentic effort

471

00:33:57,880 --> 00:33:58,880

clearly lacked.

472

00:33:59,880 --> 00:34:06,400

With the gas on, the pressure in the tank is building.

473

00:34:06,400 --> 00:34:10,880

Right now we're at about 80, 75, 80 psi.

474

00:34:10,880 --> 00:34:15,880

That's about twice the pressure of a car tire and more than good enough for a test.

475

00:34:15,880 --> 00:34:16,880

I'm going to go.

476

00:34:16,880 --> 00:34:17,880

Okay.

477

00:34:17,880 --> 00:34:18,880

Ready?

478

00:34:18,880 --> 00:34:19,880

Firing!

479

00:34:19,880 --> 00:34:20,880

Firing!

480

00:34:20,880 --> 00:34:21,880

Three, two, one.

481

00:34:21,880 --> 00:34:22,880

Yeah!

482

00:34:22,880 --> 00:34:26,040

I didn't see where that went.

483

00:34:26,040 --> 00:34:27,240

I didn't see where it went either.

484

00:34:27,240 --> 00:34:29,080

I just heard it go pop.

485

00:34:29,080 --> 00:34:31,600

Not so much pop as boom.

486

00:34:31,600 --> 00:34:37,520

The projectile came out so fast that no one can locate it except for Jamie, who's always

487

00:34:37,520 --> 00:34:39,240

got his eye on the ball.

488

00:34:39,240 --> 00:34:40,240

Oh!

489

00:34:40,240 --> 00:34:41,240

Where is it?

490

00:34:41,240 --> 00:34:42,240

It's stuck.

491

00:34:42,240 --> 00:34:43,240

Dude!

492

00:34:43,240 --> 00:34:44,240

That is so cool!

493

00:34:44,240 --> 00:34:45,240

That's perfect!

494

00:34:45,240 --> 00:34:56,240

At last, Adam's shown that steam can fire a projectile with serious power.

495

00:34:56,240 --> 00:34:58,960

It's wedged in there like, I don't know if I could build something that could wedge

496

00:34:58,960 --> 00:34:59,960

it in there that hard.

497

00:34:59,960 --> 00:35:03,600

Oh, apparently I did.

498

00:35:03,600 --> 00:35:06,200

It's the perfect proof of concept test.

499

00:35:06,200 --> 00:35:09,160

So now it's Big Brother Beckins.

500

00:35:09,160 --> 00:35:11,040

Well full scale, that shouldn't take that long.

501

00:35:11,040 --> 00:35:12,040

It's pretty simple.

502

00:35:12,040 --> 00:35:13,400

We could knock that out in a couple of days.

503

00:35:13,400 --> 00:35:14,400

And it'll be dramatic.

504

00:35:14,400 --> 00:35:18,160

I mean, we should be able to launch a cannonball pretty far using steam.

505

00:35:18,160 --> 00:35:23,120

The new cannon is going to be 20 times the size of Adam's prototype.

506

00:35:23,120 --> 00:35:30,640

And its success all boils down to this boiler, which some viewers might recognize.

507

00:35:30,640 --> 00:35:36,040

This giant tube was once part of the hair cream myth fighter.

508

00:35:36,040 --> 00:35:40,240

But before that, it started life as the boat slamming ceramic.

509

00:35:40,240 --> 00:35:44,640

And as a boiler, it could be just as dangerous.

510

00:35:44,640 --> 00:35:49,400

This iteration of the steam cannon, and hopefully the last iteration of the steam cannon, is

511

00:35:49,400 --> 00:35:51,360

basically just a big pressure vessel.

512

00:35:51,360 --> 00:35:52,360

A boiler.

513

00:35:52,360 --> 00:35:55,880

And we're going to put a couple of inches of water in a sealed metal container with

514

00:35:55,880 --> 00:35:56,880

a valve on it.

515

00:35:56,880 --> 00:36:01,200

We're going to put a barrel on front of the valve, cannonball, down that barrel.

516

00:36:01,200 --> 00:36:03,320

We're going to start heating up that water.

517

00:36:03,320 --> 00:36:06,280

It's going to create steam, which is going to build pressure inside here.

518

00:36:06,280 --> 00:36:11,640

And when we get the pressure we want, we release our valve, the cannonball shoots off into

519

00:36:11,640 --> 00:36:13,240

the distance.

520

00:36:13,240 --> 00:36:17,120

And our insurance company is freaking out about this thing.

521

00:36:17,120 --> 00:36:18,600

And with good reason.

522

00:36:18,600 --> 00:36:22,440

When you do the math, the pressures in this thing are enormous.

523

00:36:22,440 --> 00:36:27,760

We've got enough pressure in this boiler to actually bow out the bottom about a half

524

00:36:27,760 --> 00:36:28,760

an inch.

525

00:36:28,760 --> 00:36:32,920

Well, a few safety reinforcements take care of that.

526

00:36:32,920 --> 00:36:36,880

Meaning she's ready for launch.

527

00:36:36,880 --> 00:36:42,840

We have to finish this episode with some kind of explosion or launch that goes pooh.

528

00:36:42,840 --> 00:36:45,160

That's in my contract.

529

00:36:45,160 --> 00:36:46,600

Coming right up.

530

00:36:46,600 --> 00:36:48,880

Heavy duty cannon calamity.

531

00:36:48,880 --> 00:36:49,880

Firing.

532

00:36:49,880 --> 00:37:01,160

And three, two, one.

533

00:37:01,160 --> 00:37:04,440

The myth of the Archimedes steam cannon is busted.

534

00:37:04,440 --> 00:37:09,120

Adam and Jamie's efforts were about as effective as a mop and a monsoon.

535

00:37:09,120 --> 00:37:11,080

But all is not lost.

536

00:37:11,080 --> 00:37:15,600

They've built a brand new cannon that is way beyond the realm of what our comedies

537

00:37:15,600 --> 00:37:16,600

could do.

538

00:37:16,600 --> 00:37:20,600

But here at Alameda, it might just work.

539

00:37:20,600 --> 00:37:23,280

Okay, everybody stand back.

540

00:37:23,280 --> 00:37:25,000

The gun's now loaded.

541

00:37:25,000 --> 00:37:27,000

Funny man.

542

00:37:27,000 --> 00:37:30,720

He's a funny, funny man.

543

00:37:30,720 --> 00:37:35,520

With the boiler fully primed, the rest of the calamitous cannon is assembled.

544

00:37:35,520 --> 00:37:37,520

But how does it work again?

545

00:37:37,520 --> 00:37:40,480

We've got a boiler here.

546

00:37:40,480 --> 00:37:42,880

This will be sealed with this valve right here.

547

00:37:42,880 --> 00:37:46,960

It's got hot charcoal underneath it, heating up some water inside.

548

00:37:46,960 --> 00:37:51,840

Once it's sealed, that water turning to steam will start to build pressure in this boiler.

549

00:37:51,840 --> 00:37:55,040

When that pressure, which we'll view on this gauge remotely from a camera, gets to around

550

00:37:55,040 --> 00:37:58,200

175 to 200 psi, that's pounds per square inch.

551

00:37:58,200 --> 00:38:01,920

We're going to remotely release this valve from back behind the glass shields.

552

00:38:01,920 --> 00:38:05,520

And that valve is going to let all of that steam pressure inside this boiler into the

553

00:38:05,520 --> 00:38:09,240

barrel all at once behind the wadding, behind the cannonball, and shoot that cannonball

554

00:38:09,280 --> 00:38:12,480

at the city of San Francisco.

555

00:38:12,480 --> 00:38:14,080

It all sounds so easy.

556

00:38:14,080 --> 00:38:19,040

With the hot coals shoveled into place, it's from now on that the boiler should be building

557

00:38:19,040 --> 00:38:20,040

pressure.

558

00:38:20,040 --> 00:38:22,920

But after five minutes, it's not going well.

559

00:38:22,920 --> 00:38:25,360

It's going to take an hour to build that kind of pressure.

560

00:38:25,360 --> 00:38:29,320

I'm reading exactly bupkis on the pressure meter.

561

00:38:29,320 --> 00:38:35,520

But as soon as we see it start to climb, we're going to retreat over to our safety zone and

562

00:38:35,520 --> 00:38:37,760

get ready to launch.

563

00:38:37,760 --> 00:38:38,760

It's going to work.

564

00:38:38,800 --> 00:38:39,800

It's going to work.

565

00:38:39,800 --> 00:38:41,040

I'm willing it to work.

566

00:38:41,040 --> 00:38:45,360

All of my will is working on this thing.

567

00:38:45,360 --> 00:38:49,560

But when it comes to steam cannons, where there's a will, there's a won't.

568

00:38:49,560 --> 00:38:51,560

I don't have any pressure here.

569

00:38:51,560 --> 00:38:53,240

Jamie's answer?

570

00:38:53,240 --> 00:38:57,720

Blast those coals with compressed air, which heats them enough to threaten the rubber in

571

00:38:57,720 --> 00:39:01,400

their all-important butterfly valve.

572

00:39:01,400 --> 00:39:06,680

Wedding a child to cool the valve threatens to put out the coals.

573

00:39:06,880 --> 00:39:08,400

And there's still no pressure.

574

00:39:08,400 --> 00:39:12,640

No, I'm not seeing any effect yet.

575

00:39:12,640 --> 00:39:17,280

When everything goes wrong, you might as well wrap the boiler in insulating fiberglass.

576

00:39:17,280 --> 00:39:19,680

And, why do you know?

577

00:39:19,680 --> 00:39:21,680

Hey, it's moving!

578

00:39:21,680 --> 00:39:23,840

We're making some steam.

579

00:39:23,840 --> 00:39:24,840

It's climbing.

580

00:39:24,840 --> 00:39:26,840

It's now like 11 psi.

581

00:39:26,840 --> 00:39:28,840

It's moving slowly.

582

00:39:28,840 --> 00:39:32,720

But it's moving!

583

00:39:32,720 --> 00:39:34,720

But is it moving fast enough?

584

00:39:35,520 --> 00:39:40,520

Gotta get from there to there.

585

00:39:40,520 --> 00:39:46,880

Something tells me that the angle of the sun is going to have a lot more to do with when

586

00:39:46,880 --> 00:39:49,800

we launch this thing than the angle of this needle.

587

00:39:49,800 --> 00:39:56,680

With the sun dropping, the race is on to get the cannon fired before Jamie loses his sanity.

588

00:39:56,680 --> 00:40:03,120

By my watch, it's climbing about a psi every two, two and a half minutes.

589

00:40:03,120 --> 00:40:06,560

And the sun is going to set at about 5.30.

590

00:40:06,560 --> 00:40:13,000

So we've got about 70 minutes and we want to get...

591

00:40:13,000 --> 00:40:17,560

We're just going to have to be fine with about 60 to 70 psi maybe.

592

00:40:17,560 --> 00:40:20,120

That's only a third of the pressure they wanted.

593

00:40:20,120 --> 00:40:24,640

But beggars can't be choosers and the mythmusters are currently begging.

594

00:40:24,640 --> 00:40:29,680

Please, I want to put this one to bed.

595

00:40:29,680 --> 00:40:31,680

Jamie adds a bunch more coals.

596

00:40:33,120 --> 00:40:35,120

Then a blast of air.

597

00:40:37,120 --> 00:40:40,120

We're at 45 psi.

598

00:40:40,120 --> 00:40:44,120

And at last they've reached the danger zone.

599

00:40:44,120 --> 00:40:46,120

We're above 50 psi.

600

00:40:46,120 --> 00:40:49,120

Alright, it's time for us to go. Let's go. Come on.

601

00:40:50,120 --> 00:40:55,120

With the team hunkering down for safety, the pressure in the boiler continues to climb.

602

00:40:55,120 --> 00:40:59,120

We're at just over 60 psi here.

603

00:40:59,120 --> 00:41:01,120

I swear, look at how hot that valve was getting.

604

00:41:01,120 --> 00:41:02,120

I don't want it to fail.

605

00:41:02,120 --> 00:41:03,120

You're right.

606

00:41:03,120 --> 00:41:06,120

My vote would be for firing it within the next five minutes.

607

00:41:06,120 --> 00:41:08,120

This just has to work.

608

00:41:08,120 --> 00:41:11,120

If it doesn't work, we're idiots.

609

00:41:11,120 --> 00:41:14,120

Now we may be idiots anyway and that's fine with me.

610

00:41:14,120 --> 00:41:17,120

But I'd rather be idiots with an explosion.

611

00:41:17,120 --> 00:41:18,120

Wouldn't we all?

612

00:41:18,120 --> 00:41:20,120

Ten seconds.

613

00:41:20,120 --> 00:41:24,120

The mythmusters have toiled for an age on a steam powered cannon.

614

00:41:24,120 --> 00:41:27,120

And this is their last chance.

615

00:41:27,120 --> 00:41:29,120

It's now or never.

616

00:41:29,120 --> 00:41:31,120

68 psi, your go for launch.

617

00:41:31,120 --> 00:41:41,120

Okay, 68 psi, firing in three, two, one.

618

00:41:41,120 --> 00:41:42,120

Yeah!

619

00:41:42,120 --> 00:41:44,120

Hey!

620

00:41:44,120 --> 00:41:47,120

Yeah! Boom!

621

00:41:47,120 --> 00:41:49,120

Ha ha ha ha ha ha ha ha.

622

00:41:49,120 --> 00:41:50,120

Put your eyes off of it.

623

00:41:50,120 --> 00:41:54,120

At last, a cannon catapulted by steam.

624

00:41:54,120 --> 00:41:56,120

It's mission accomplished.

625

00:41:56,120 --> 00:42:01,120

But how far did the 24 pound ball actually fly?

626

00:42:01,120 --> 00:42:04,120

Yeah!

627

00:42:04,120 --> 00:42:07,120

Let's measure at this launch.

628

00:42:07,120 --> 00:42:10,120

Dude, I'm so psyched.

629

00:42:10,120 --> 00:42:13,120

I feel like really good.

630

00:42:13,120 --> 00:42:15,120

Ha ha ha.

631

00:42:15,120 --> 00:42:20,120

They sure scored with a cannon, but where's the ball?

632

00:42:20,120 --> 00:42:24,120

After scouring the entire grounds, they're about to give up.

633

00:42:24,120 --> 00:42:30,120

Until a mile down the runway, J.B. hits paydirt.

634

00:42:30,120 --> 00:42:35,120

Oh, I'll be darned.

635

00:42:35,120 --> 00:42:36,120

Ha ha ha ha ha.

636

00:42:36,120 --> 00:42:37,120

You didn't find it.

637

00:42:37,120 --> 00:42:38,120

I did.

638

00:42:38,120 --> 00:42:39,120

You did?

639

00:42:39,120 --> 00:42:41,120

Dude!

640

00:42:41,120 --> 00:42:42,120

Ha ha ha ha ha.

641

00:42:42,120 --> 00:42:44,120

That was a solid mile.

642

00:42:44,120 --> 00:42:46,120

The ball made it a solid mile.

643

00:42:46,120 --> 00:42:47,120

But that's not where it landed.

644

00:42:47,120 --> 00:42:51,120

No, no, but still, it might have gone a thousand feet or so, it would be my guess.

645

00:42:51,120 --> 00:42:55,120

We were only at about 65 PSI, maybe 68.

646

00:42:55,120 --> 00:42:57,120

And we were shooting for 200.

647

00:42:57,120 --> 00:42:58,120

We were ready to do that.

648

00:42:58,120 --> 00:43:03,120

It just took too long, and so we fired it a little prematurely.

649

00:43:03,120 --> 00:43:06,120

Yeah, we might have ended up hitting San Francisco at 200 PSI.

650

00:43:06,120 --> 00:43:09,120

So we were able to make a steam cannon, finally.

651

00:43:09,120 --> 00:43:13,120

But I think we're agreed, our comedies in Leonardo could not have.

652

00:43:13,120 --> 00:43:14,120

I agree.

653

00:43:14,120 --> 00:43:15,120

Alright.

654

00:43:15,120 --> 00:43:16,120

Let's bust it.

655

00:43:16,120 --> 00:43:18,120

The sun's gone down, let's go home.

656

00:43:18,120 --> 00:43:19,120

Okay.

657

00:43:21,120 --> 00:43:22,120

We'll be right back.

658

00:43:22,120 --> 00:43:23,120

Bye.