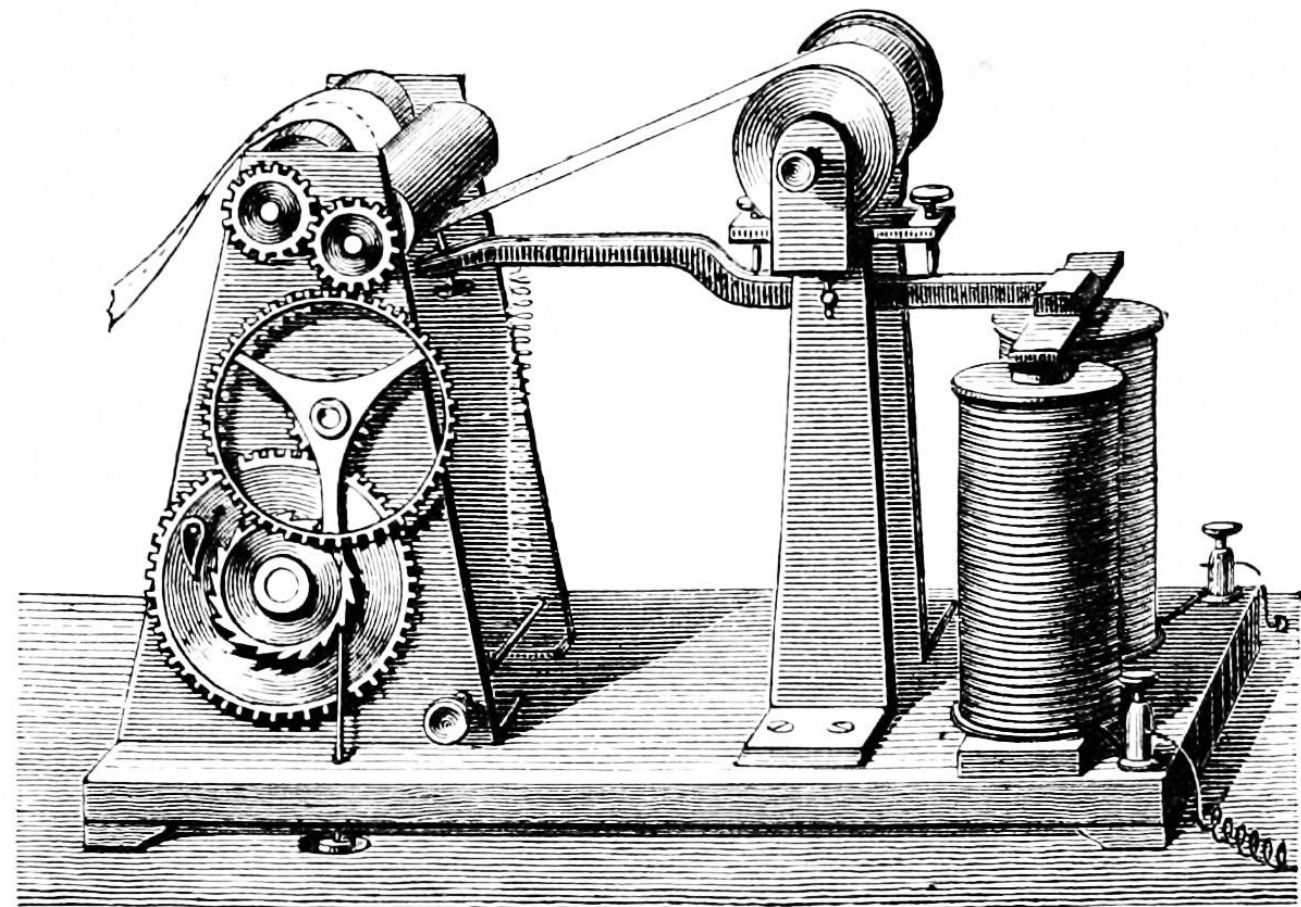**Electric communication will never be a substitute for the face of someone who with their soul encourages another person to be brave and true.**

**Charles Dickens, 1856
"The Wreck of the Golden Mary"**

Arizona State University
SES 194

Energy in Everyday Life

Order of Magnitude Estimate

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How much energy is in a gallon of gas?

How does one even begin to answer such questions and be relatively confident of the answer??

Here are 8 guidelines …

1. *Guess:* **Make a guess before solving a problem. The guess may suggest a rough way to start.**

GUESS

Guessing - and checking and modifying your guess - improves your guesses for future estimates.

2. *Talk to your gut*: When you make a guess, ask your gut how it feels. Is it too high? Too low? If the guess is both, then it's probably reliable.

"TRUST YOUR HUNCHES. THEY'RE USUALLY BASED ON FACTS FILED AWAY JUST BELOW THE CONSCIOUS LEVEL."

DR. JOYCE BROTHERS

3. *Divide and conquer:* Split a complicated problem into manageable chunks, especially if dealing with tiny or huge numbers, or when a formula naturally factors into parts (such as volume ~ length × width × height).
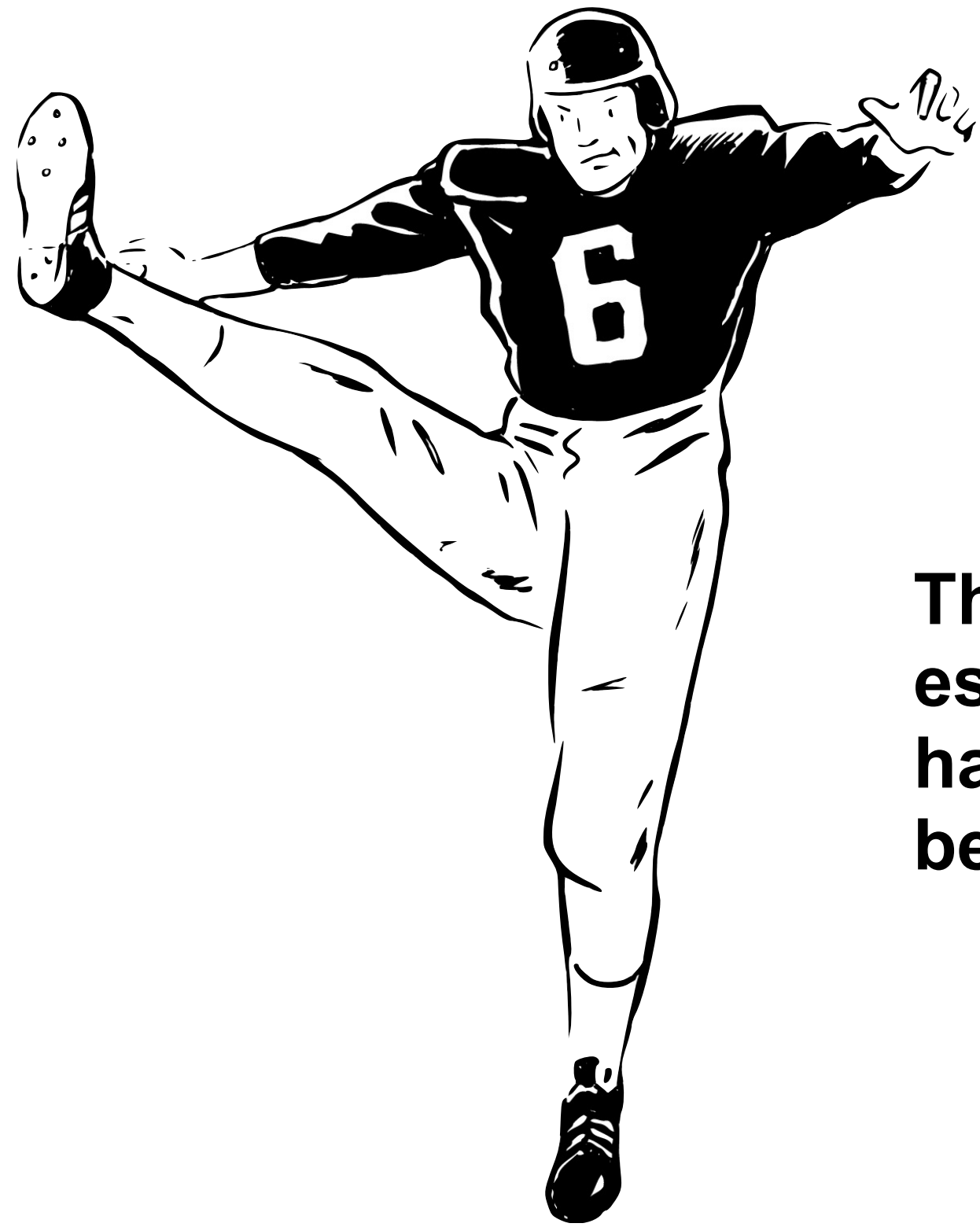
4. *Lie skillfully*: Simplify a complicated situation by assuming what you need to know to solve it.

For example, when you do not know the shape of an object, assume it is a sphere or a cube.

5. *Punt*: **If you're concerned about a physical effect, do not worry about it in your first attempt at a solution.**

The productive strategy is to start estimating, to explore, and then to handle the exceptions after you better understand.

6. *Use guerrilla warfare*: **Dredge up common knowledge and related facts to help you make an estimate.**

Common Knowledge

Share what you know.

7. *Lower your standards*: **If you cannot estimate the entire problem, estimate parts of it. Estimating a part can clarify what you might need to estimate the original problem.**

8. *Cross-check*: Make an estimate in more than one way to check if your estimates correspond.