Source: KBhPHYS201IntroToElectrostaticsLN

# 1 | A Van De Graff Generator

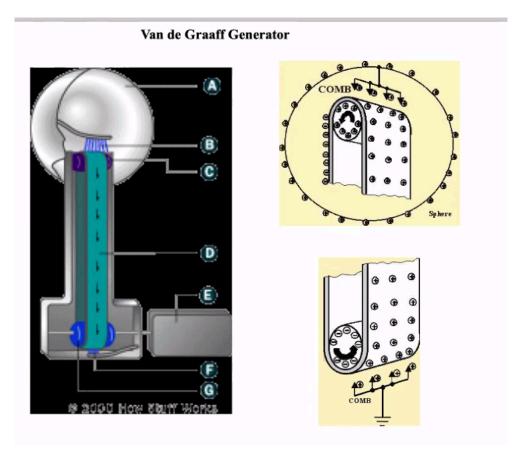


Figure 1: Screen Shot 2020-09-09 at 10.25.51 AM.png

#### **Basic Procedures**

- 1. User turns crank
- 2. User brings handle to the globe
- 3. Electrostatic Bang!

### But, how does it work?

- · Cranks connects to a white roller, and next to it some metal teeth
- · Roller connnects to transparent belt, and on the other end, under the globe, there is a similar roller
- · Metal combs next to rollers
- · When cranks are turned, the bottom roller becomes negative, and the top roller becomes positive
- · So, electron flow between handle (connected to bottom) and globe (connected to top)

## Why Van de Graff is so exciting

Van de graff generator so exciting because, unlike normal statics, charges are added from the inside (see, wire B from the figure)

- When you add additional changes, because conductor wants to stay 0, the additional charges can't
  do anything but accept it
- · Sphere slightly curved to make up for gaping hole
- Normal door-handle statics would much rater simply eject the added change as their electric field is pointed at one direction against charge introduction

#### Why are there sparks through the air?

- One dome that's positive, one dome is negative
- So, what happens when Spark! happens?
  - Enough charge to overcome the electric field resistance [KBhPHYS201Resistance] of air (like 3.4 million Volts/metre), and **air ionizes** air atoms becomes so attracted that their electrons ditch their nuclei and air suddenly becomes a conductors
  - Neutral air has high resistance, but when it ionizes, the air looses its resistance (drops) and becomes nicely conductive
  - So then, current (Coulomb/s) that flow in the air suddenly spark up because of sudden loss of resistance, discharging the negative dom