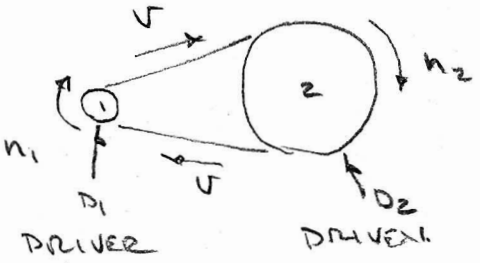
How to Get Really Low Speeds
or
Compound Belt, Chain and Gear Transmission Systems.



RECALL

n = RPM

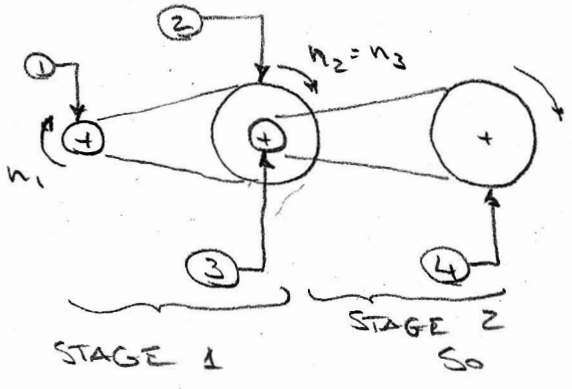
D = DIAMETER

N = NUMBER OF TEETH.

$$\frac{n_1}{n_2} = \frac{D_2}{D_1} = \frac{N_2}{N_1}$$ "GEAR" RATIO.

THERE ARE LIMITATIONS ON HOW SLOW (2) CAN GO BECAUSE THE SIZE OF A PULLEY OR SPROCKET CAN ONLY BE SO BIG. (GEARS ARE NOT SO LIMITED.)

GETTING THE DRIVEN SIDE TO MOVE SLOWLY AND MAINTAIN REASONABLE SIZE IS EASY... JUST COMPOUND THE DRIVE SYSTEM.



$$① \rightarrow ②: \frac{n_1}{n_2} = \frac{D_2}{D_1} \rightarrow n_2 = n_1\left(\frac{D_1}{D_2}\right)$$

$$③ \rightarrow ④: \frac{n_3}{n_4} = \frac{D_4}{D_3} \rightarrow n_3 = n_4\left(\frac{D_4}{D_3}\right)$$

BUT $n_2 = n_3$

$$n_1\left(\frac{D_1}{D_2}\right) = n_4\left(\frac{D_4}{D_3}\right)$$

THUS $$\frac{n_1}{n_4} = \left(\frac{D_2}{D_1}\right)\left(\frac{D_4}{D_3}\right)$$

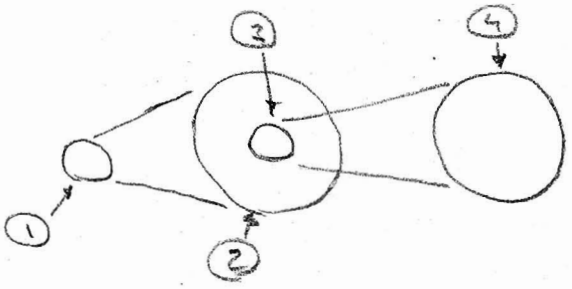
STEP DOWN FROM ① → ② | STEP DOWN FROM ③ → ④

BECAUSE THESE TWO MULTIPLY THE STEP DOWN (OR UP) CAN BE HUGE EVEN WITH REASONABLE PULLEY SIZES.

IN ASSIGNMENT 1, QUESTION 2

0.5 hp, 1160 RPM DRIVER.
520 RPM & 65 RPM DRIVEN.

THE 520 RPM HAS BEEN NICELY SOLVED BY YOU.
HERE IS AN IDEA HOW TO GET THE 65 RPM.



$$\frac{n_1}{n_4} = \left(\frac{D_2}{D_1}\right)\left(\frac{D_4}{D_3}\right).$$

IF YOU WANT $\frac{D_2}{D_1} = \frac{D_4}{D_3}$,
(MAKES THE DESIGN EASIER).

THEN JUST FIND $\sqrt{\frac{n_1}{n_4}} = \frac{D_2}{D_1} = \frac{D_4}{D_3}$

IN OUR CASE $\sqrt{\frac{1160}{65}} = 4.22 = \frac{D_2}{D_1} = \frac{D_4}{D_3}$

TRY IT.

TABLE 20-2 → 1160 RPM, 0.54 hp → $D_1 = 3.25"$

So $D_2 = D_1(4.22) = (3.25)(4.22) = 13.7"$

BUT 12"Ø IS THE LARGEST LISTED ON TABLE 20-3.
OH WELL EMAIL THE SUPPLIER ... I AM SURE WE CAN GET 14"

MAKE $\underline{D_2 = 14"}$

So $n_2 = n_1\left(\frac{D_1}{D_2}\right) = 1160\left(\frac{3.25}{14}\right) = 269.28$

TABLE 20-2 → 269.28, 0.54 hp → D_3 = OH MY!
LETS SAY THAT $D_3 = 6"$

PERFECT D_4 → $\frac{n_1}{n_4} = \left(\frac{D_2}{D_1}\right)\left(\frac{D_4}{D_3}\right)$ → $D_4 = \left(\frac{n_1}{n_4}\right)\left(\frac{D_1}{D_2}\right)(D_3)$.

$\therefore D_4 = \left(\frac{1160}{65}\right)\left(\frac{3.25}{14}\right)(6)$

$D_4 = 24.9"$ WOW, STILL PRETTY BIG.

WHAT WILL YOU DO?