Foot Power

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FOOT POWER

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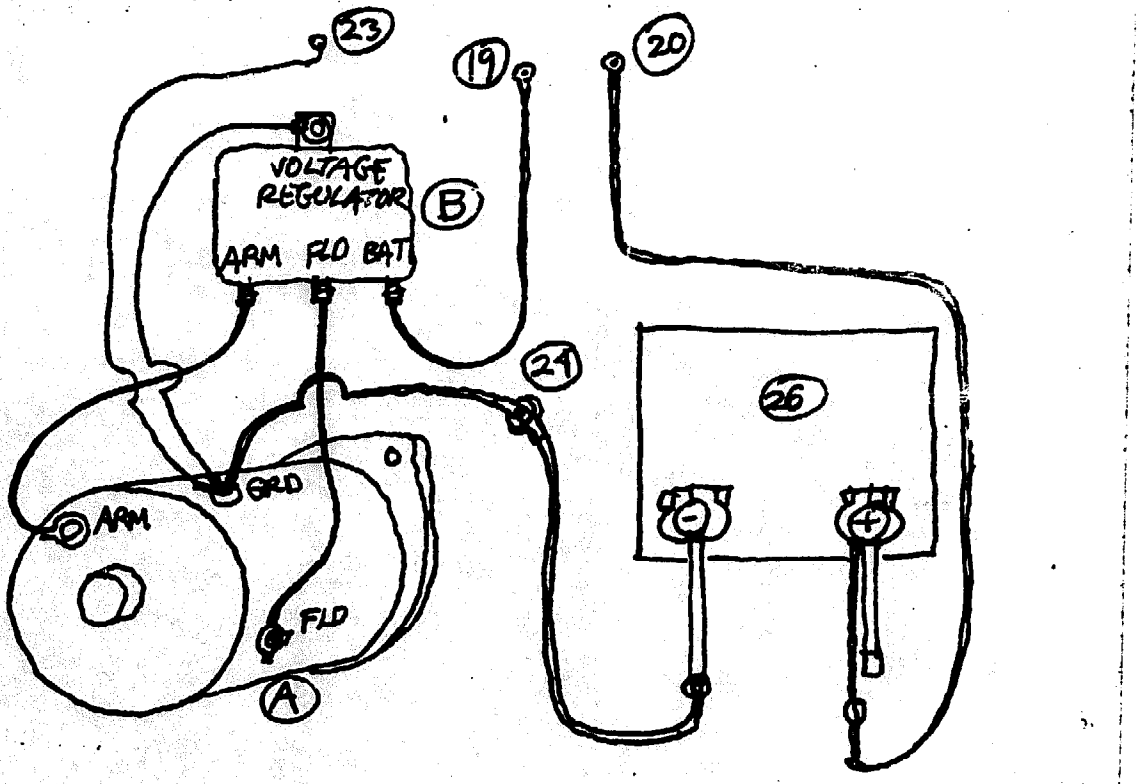
OPTIONAL GENERATOR FOR 'FOOT POWER'

If the generator and voltage regulator in A. and B. below can be purchased in your area they will provide somewhat easier pedaling with a smoother power output.



A) 1956 to 1965 rebuilt 'B' type Ford 12 volt D.C. generator

B) Voltage regulator for generator above.

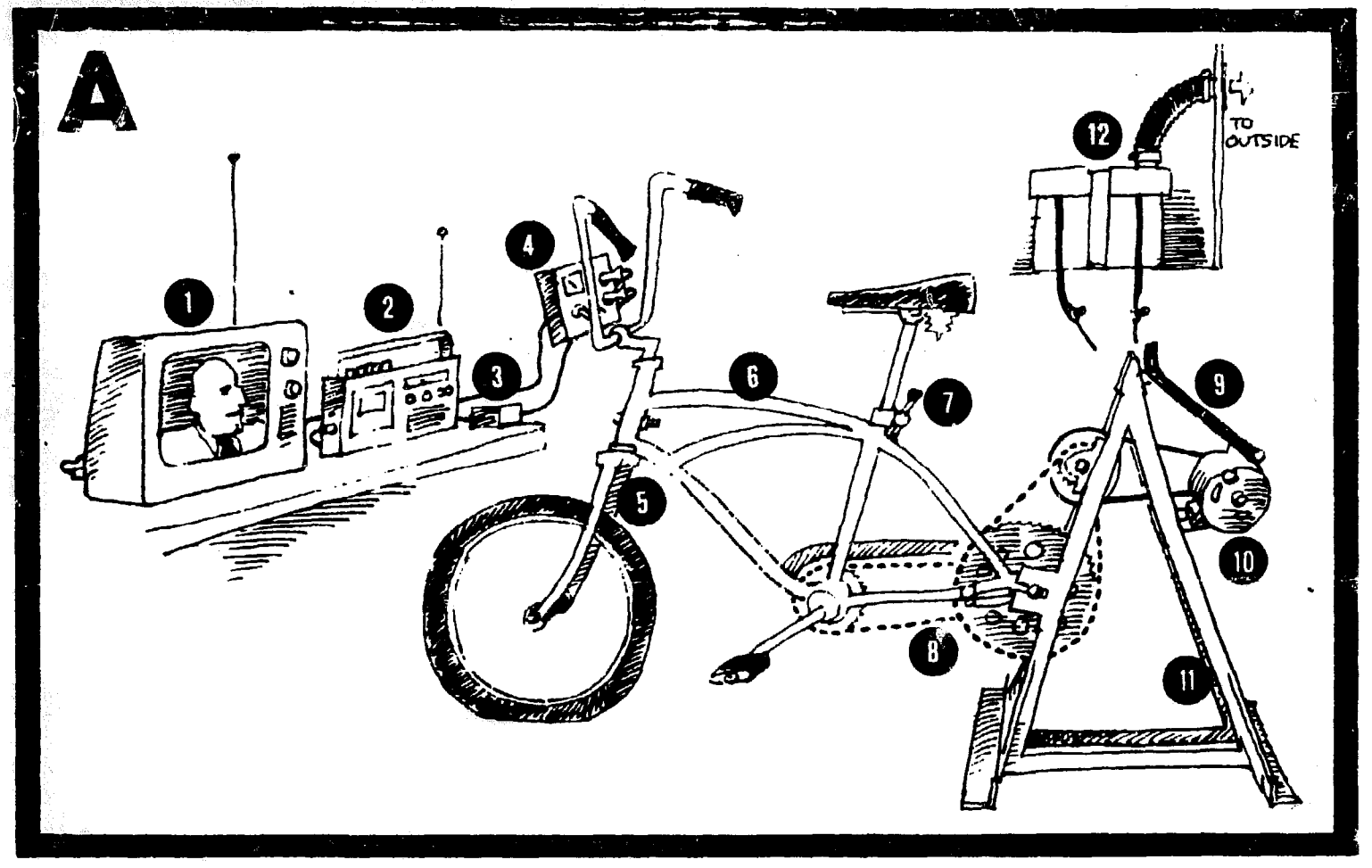
* See original plan for connections at 23), 19) and 20), 24).

* Also pulley number 17) must be changed to a 5" pulley.

* E. and F. models would also have to have ratios adjusted to use this generator.

* It is important to read instructions received with rebuilt generators regarding polarization.

* A recent development that would also increase efficiency are the new 12 volt deep discharge marine batteries.



The prototype described here was built by the North Shore Ecology Center to find correct gear ratios for electric generation and for other foot-power mechanical devices. Possible applications might be: garden mulcher, flexible shaft drill, grinder, circular saw, air or water pump, etc.

It is more elaborate than it need be for electric generation alone. Drawings E and F show examples of simplified, less expensive generators that could be built. They are based on the same gear ratio as the prototype and would deliver the same output.

Basic operation: The foot-powered generator charges a 12 volt battery. The battery, in turn, provides electricity to operate low-watt devices such as a small TV, radio, tape recorder, or lights capable of operating on 6, 9, or 12 volts. It is not necessary to pedal constantly. Pedaling must be done periodically to keep the battery charged.

The generator can produce 5–10 amps depending on how fast you can pedal. Our TV draws 16 watts or 1 1/3 amps. With battery and line loss that means you can watch TV from 3–6 minutes for every minute you pedal. And for a .5 amp radio, 6–14 minutes listening for every minute you pedal. The more people listening, the less pedaling for each person.

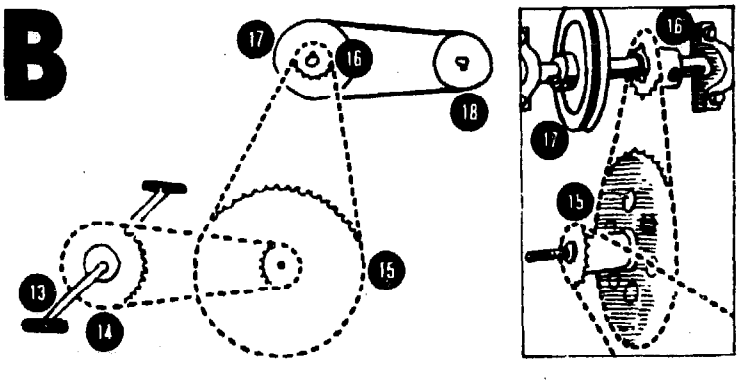
The prototype cost us $230 to build including battery. We figure E or F to cost about $130. Costs will vary depending on prices in your area and how many used parts you can employ.

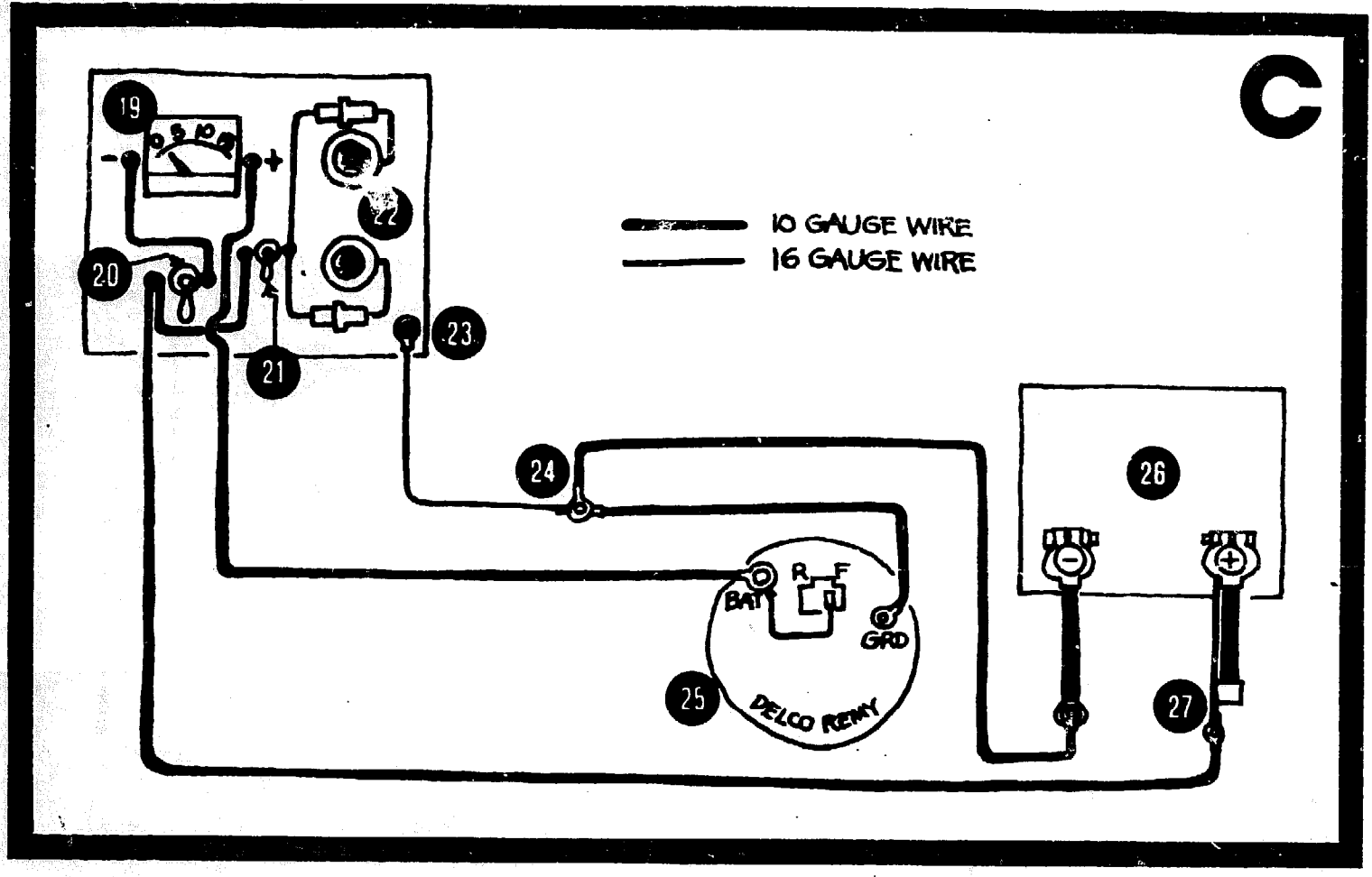
Drawing A. The prototype generator.

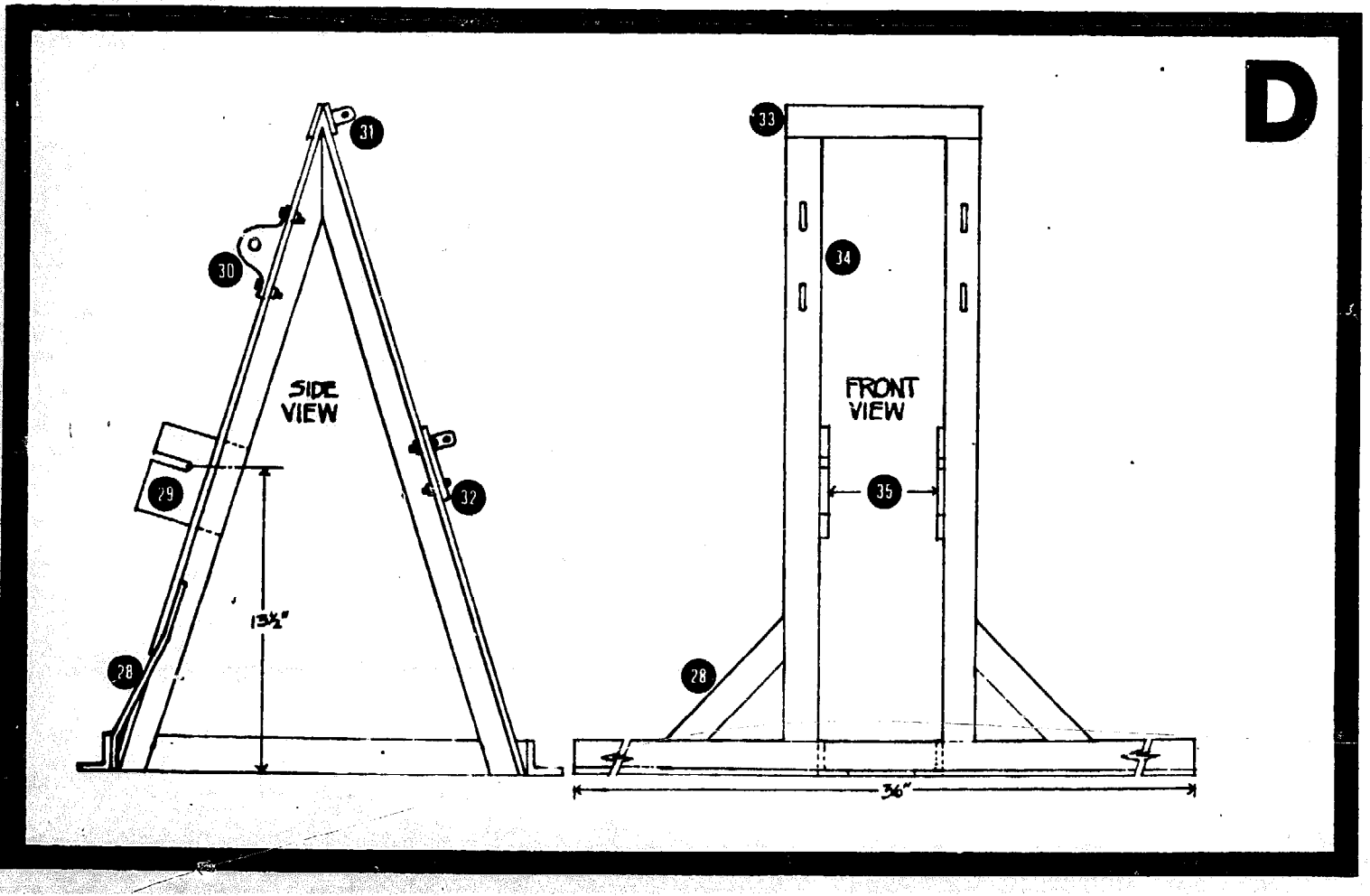
1. 110/12 volt portable TV with car adapter cord. Draws 16 watts. A Panasonic voltage regulator will be required if you want to charge the battery while the TV is on. We do without it by shutting TV off during commericals and charging then. Voltage surge is too great for TV otherwise.
2. 110/6 volt cassette tape recorder–AM/FM Radio.
3. Panasonic RP–915 Car/Boat Cord (transforms 12v to 6v or 9v, regulator allows you to pedal and listen at same time.
4. Control box. See drawing C.
5. 26" Bicycle fork. Bolt through neck keeps handlebars from turning.
6. 20" Bicycle. Boy's or girl's (adult size could also be used).
7. Extra long bar and height adjuster from Schwinn adult 3-wheeler.
8. Gearing. See drawing B.
9. Early Corvette V8 generator bracket.
10. Used Delco. 1970, 55 watt Pontiac alternator, mounting brackets, and bolts. Most any alternator will do, used (if so, have tested) or rebuilt. May have to experiment with different gearing for different output types. Also wiring, mounting and rotation may be different. DO NOT USE AUTO VOLTAGE REGULATOR.
11. "A-frame". See drawing D.
12. 12v battery that will fit in marine battery case mounted outside of house for venting of gases. If installed inside, battery case must be sealed and vented to outside via tubing. Will perform better inside. During winter battery efficiency drops: 80 degrees – 100%. 32 degrees – 65%. 0 degrees – 40%.

Drawing B. Gearing indicated provides 12.25/1 ratio. 75–80 crank RPM produces 900-980 alternator RPM, 5-10 amps, and 12 3/4 - 14 volts.

13. 6 1/2" crank from 26" bike.
14. 34 tooth crank sprocket.
15. Large 66 tooth crank sprocket from Schwinn Exercycle bolted and spot-welded to 1-speed coaster brake hub. Small sprocket (see inset) has 19 teeth.
16. 14 tooth rear hub sprocket on sprocket holder that is welded to 5/8" keyed pulley hub. Fastened to jackshaft.
17. 4" pitch pulley with 5/8" keyed hub. Same belt width as alternator pully. Fastened to jackshaft.
18. 2 3/4" pitch alternator pulley.




C
10 GAUGE WIRE
16 GAUGE WIRE
19
20
21
22
23
24
25
26
27
BAT
R
F
GRD
DELCO REMY


D
28
29
30
31
32
33
34
35
SIDE VIEW
FRONT VIEW
13½"
36"

Drawing C. Control panel and wiring diagram. Solderless terminals on wires. Parts available at auto supply and radio/electronics shops.

19. 0-15 amp DC ammeter.
20. 25 amp heavy duty auto toggle switch. THIS MUST BE TURNED OFF WHEN NOT PEDALING. Alternator field coils draw current (approx. 3 amps) and will drain battery.
21. Auto accessory switch.
22. Auto cigarette lighter receptacles with fuse holders.
23. Metal electronics utility cabinet. Ground to 24.
24. Pillow block bearing bolt (see no. 30) used as master ground for electrical system.
25. Alternator. 'R' terminal not used. 'F' or field terminal connected directly to BAT terminal.
26. Battery. Mount as close to bike as possible to cut line losses. Use voltmeter to monitor state of charge of battery.
27. Battery cable with 'fusible link' (protects alternator in case of short circuits). Use small lead. Tape large cable end.

Drawing D. 'A-frame'. Scale: 1 1/2" equal 1'. Constructed of 1 1/2" x 1 1/2" x 1/8" angle iron members welded together, unless otherwise noted.

28. Braces. 1 1/2" x 3/16" flat iron welded on at all four corners.
29. 3/16" plate welded on inside of angle iron legs. Holds rear axle of bike.
30. 2 single, 5/8" ball bearing pillow blocks and 5/8" keyed jackshaft.
31. Mounting bracket for No. 9.
32. 1/8" flat iron mounting plate (bolted on) for No. 10.
33. 1 1/2" x 3/16" flat iron welded on.
34. Adjustment slots for No. 30. ESTABLISH CORRECT POSITION AND CHAIN AND BELT LENGTH BEFORE DRILLING THESE HOLES AND BOLT HOLES FOR 32.
35. 5 1/4" for OUR bike. MEASURE YOUR'S BEFORE ESTABLISHING SPACING.

Drawing E. Proposed 20" friction drive model.

36. 20" bike with 26" fork.
37. 6 1/2" crank from 26" bike.
38. 34 tooth sprocket.
39. 19 tooth rear sprocket, 20" rear wheel.
40. 3" diameter friction drive mounted on alternator shaft. This will probably have to be made at machine shop.
41. Alternator mounted on opposite side for proper rotation.
42. Sears No. 6G 49171 Bicycle Exerciser (or other) or fabricate stand. Attach alternator and adjustment brackets to this.

Drawing F. Proposed adult bike, belt drive model.

43. Adult bike
44. 46 tooth sprocket.
45. 19 tooth sprocket.
46. 14" pitch 'Whizzer' pulley available from Zeemco, 2239 N. Lincoln, Chicago, Ill. 60614, $8.95. Mounted opposite side of bike chain.
47. 2 3/4" pitch pulley on alternator.
48. Alternator.
49. Sears Bicycle Exerciser.

NOTE: Any combination of gears and pulleys that results in desired ratio will work.

When you build any these models please keep North Shore Ecology Center informed of progress and effectiveness. We realize these are not step-by-step, detailed plans. So, if questions arise, please write.

If you have not done so, please send $1 to N.S.E.C. to cover costs of putting these plans together and getting them to you.

$1

Also consult these excellent books on pedal power:
PEDAL POWER, Rodale Press, Inc.
33 E. Minor St. Emmaus, PA 18049
$5.95

Technician's & Experimenter's Guide to Using Sun, Wind, & Water Power, by Richard Pierson (Chapter 13 describes a low-cost, bicycle generator designed by the engineer-author). $10.95
Parker Publ., West Nyack, NY 10994