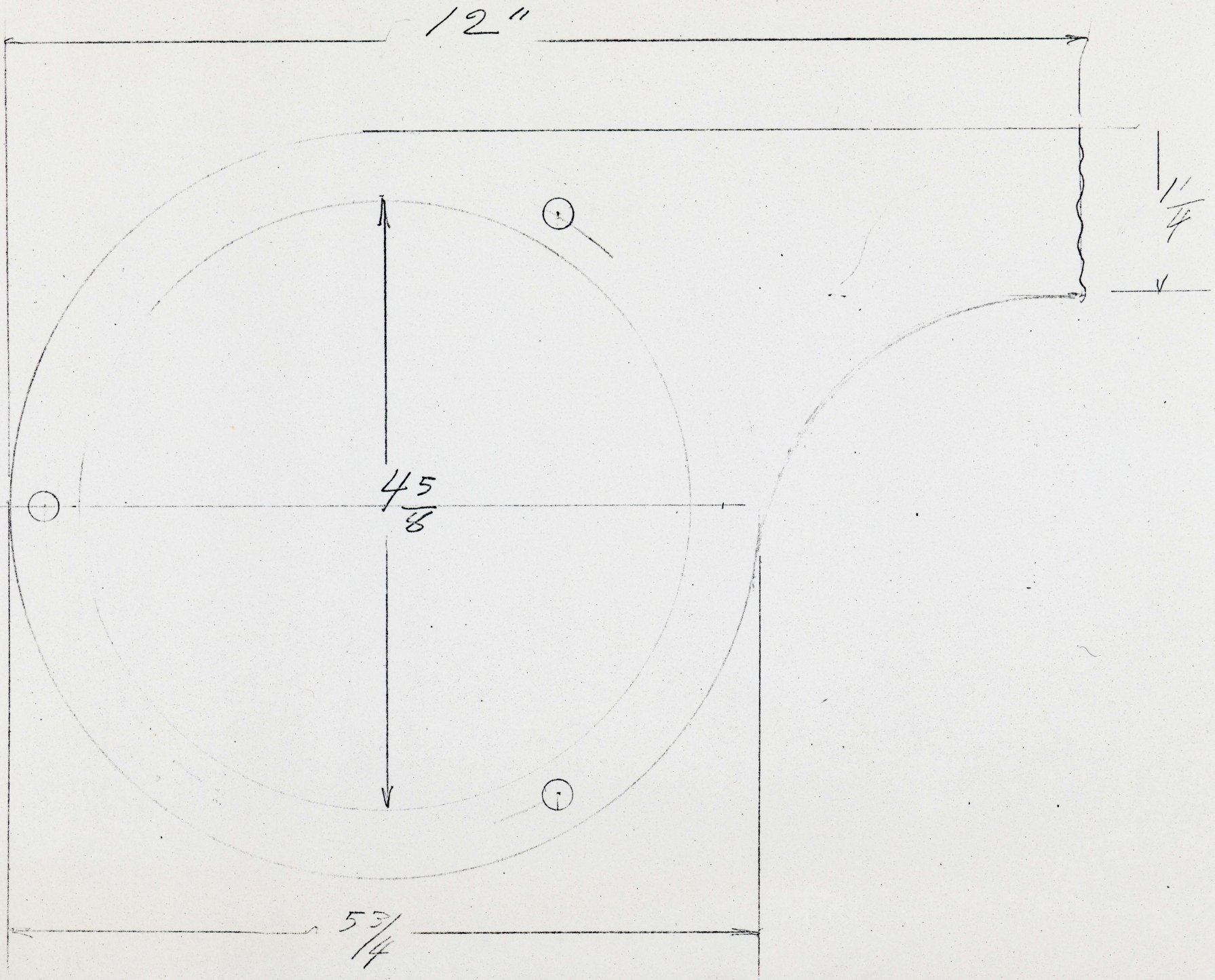
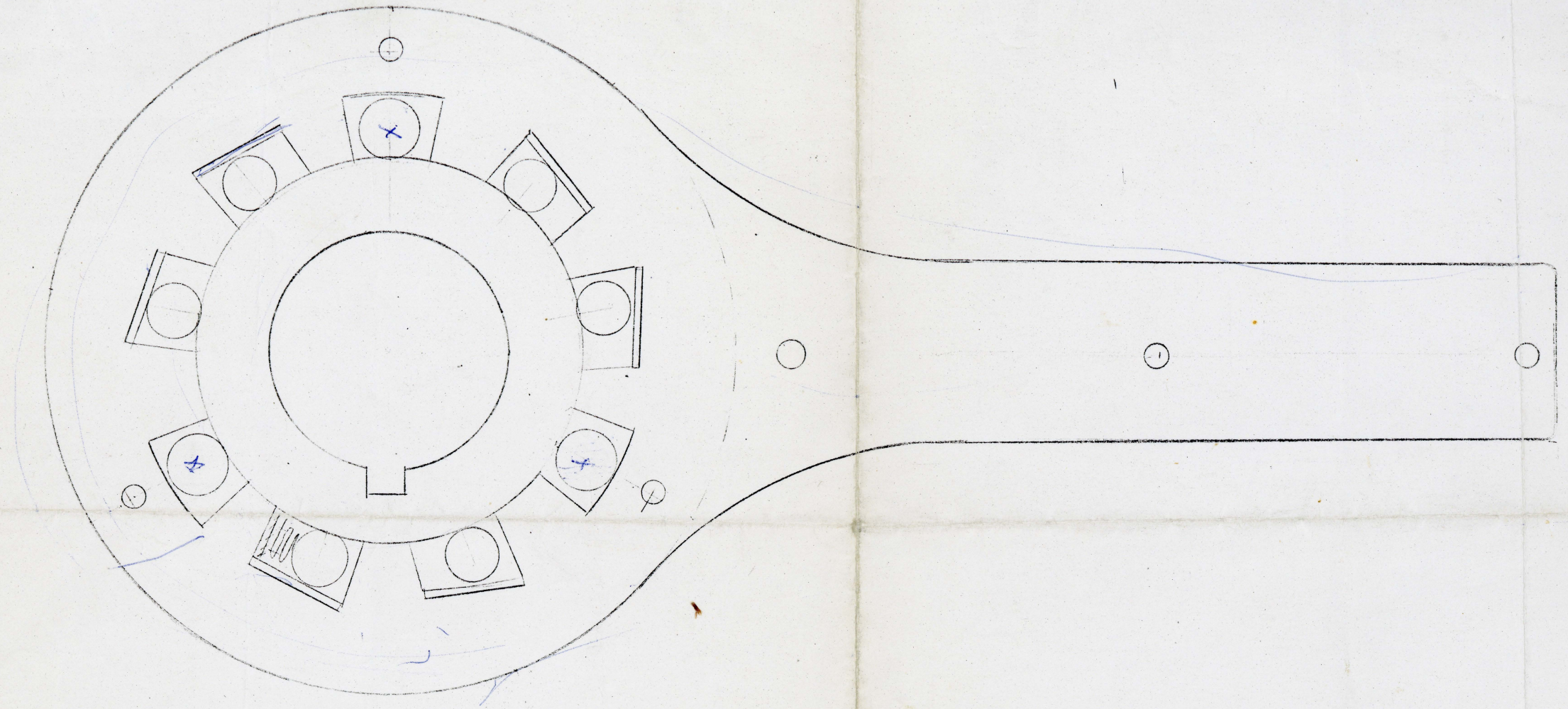


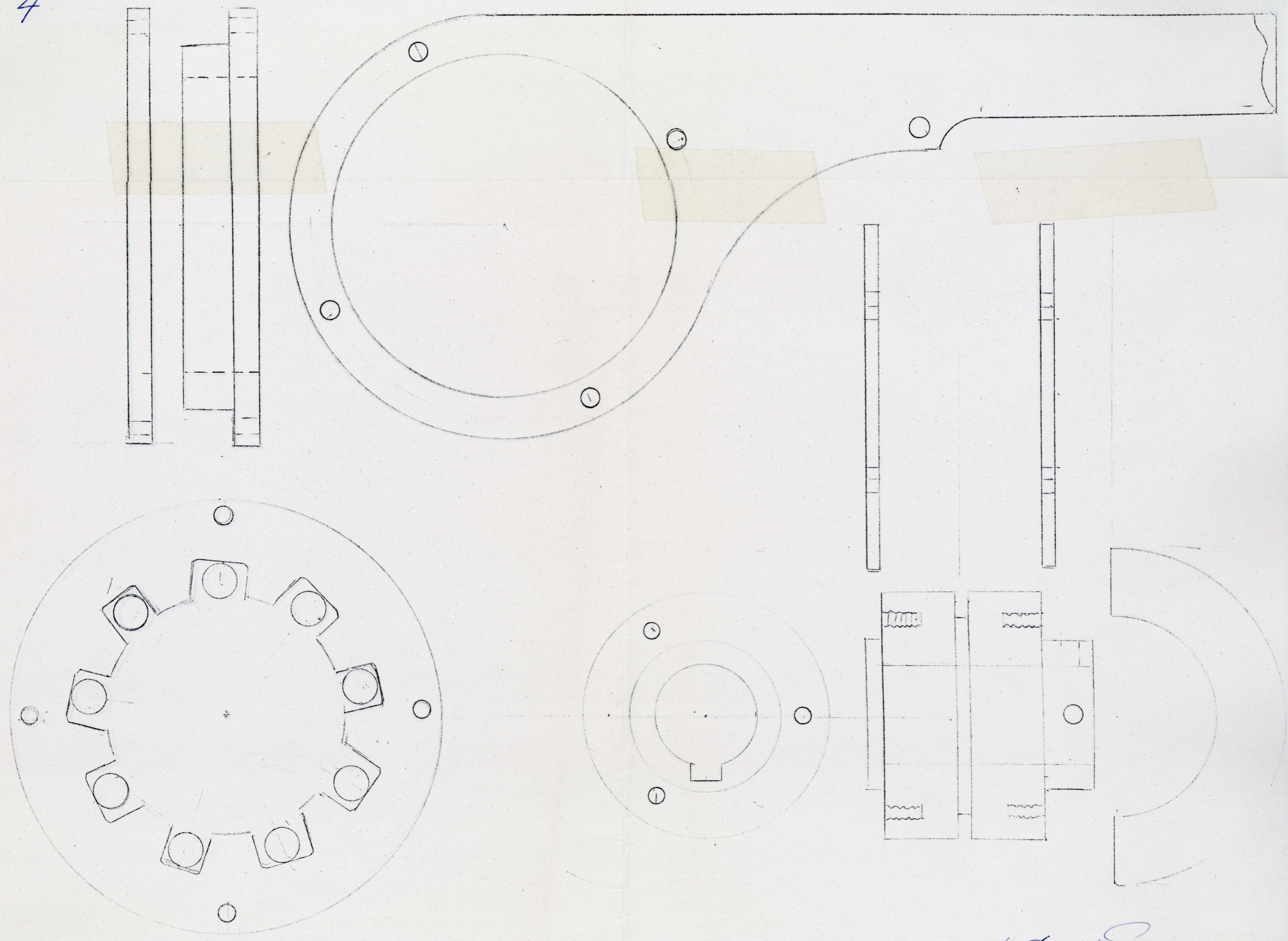
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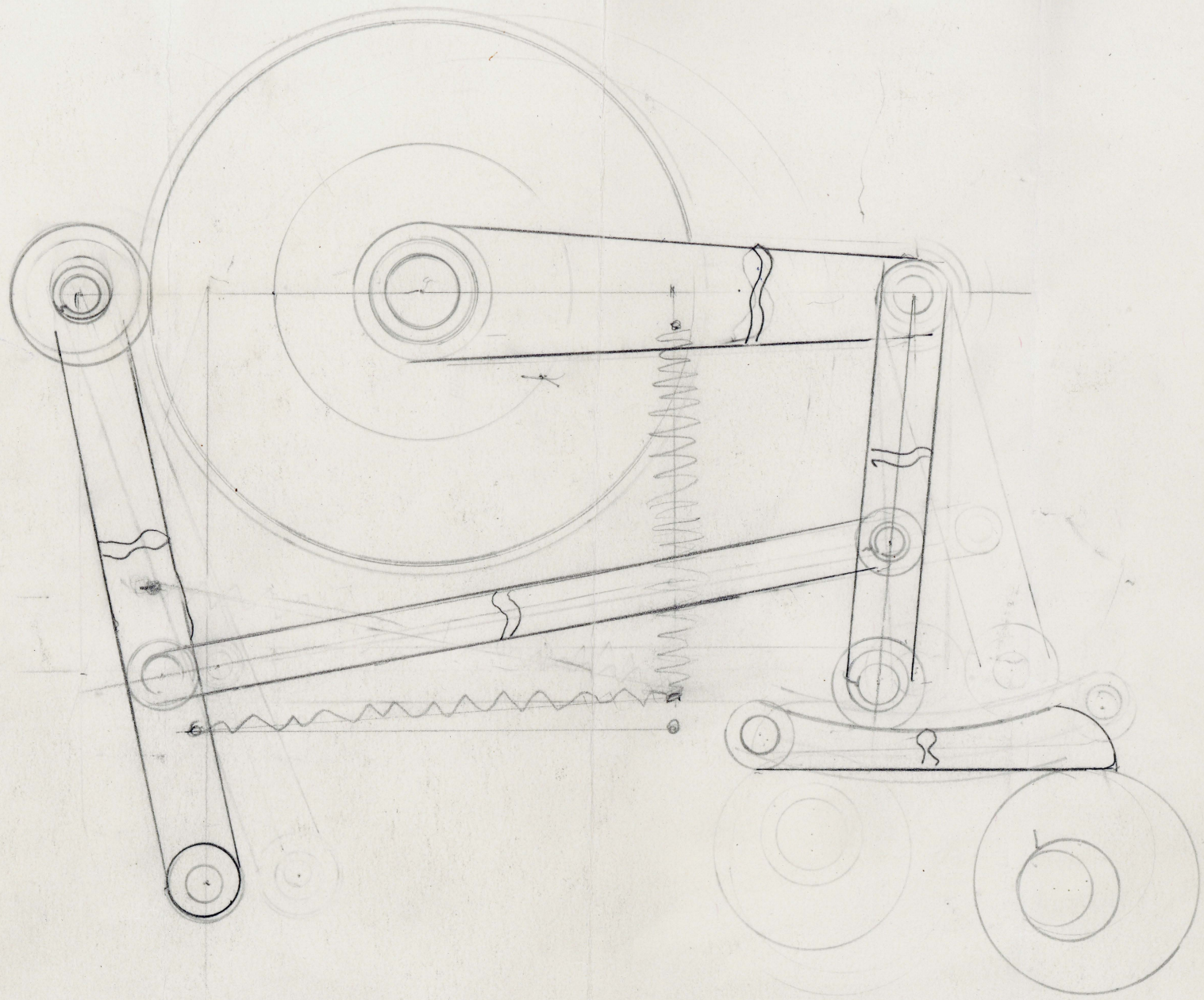


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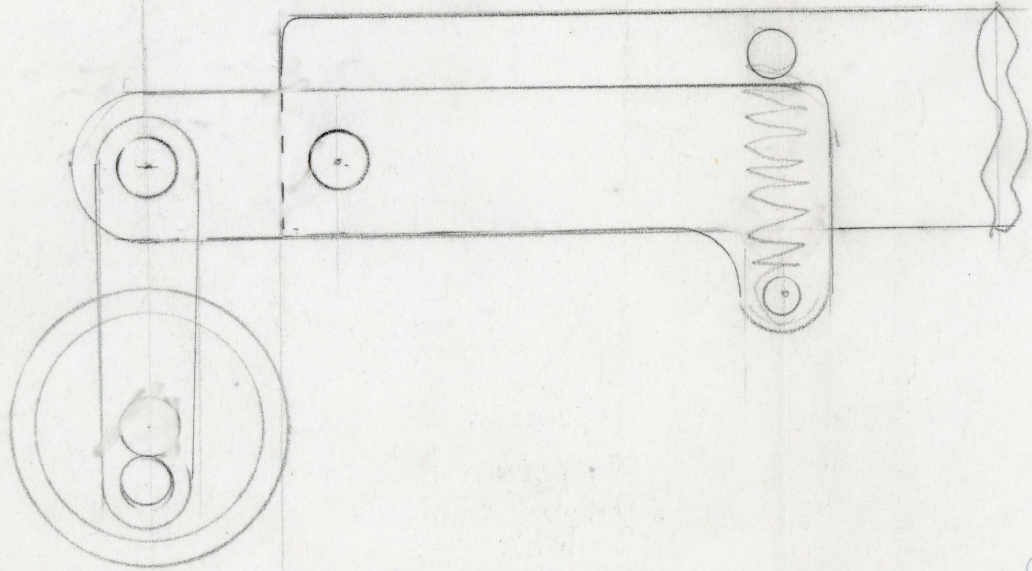
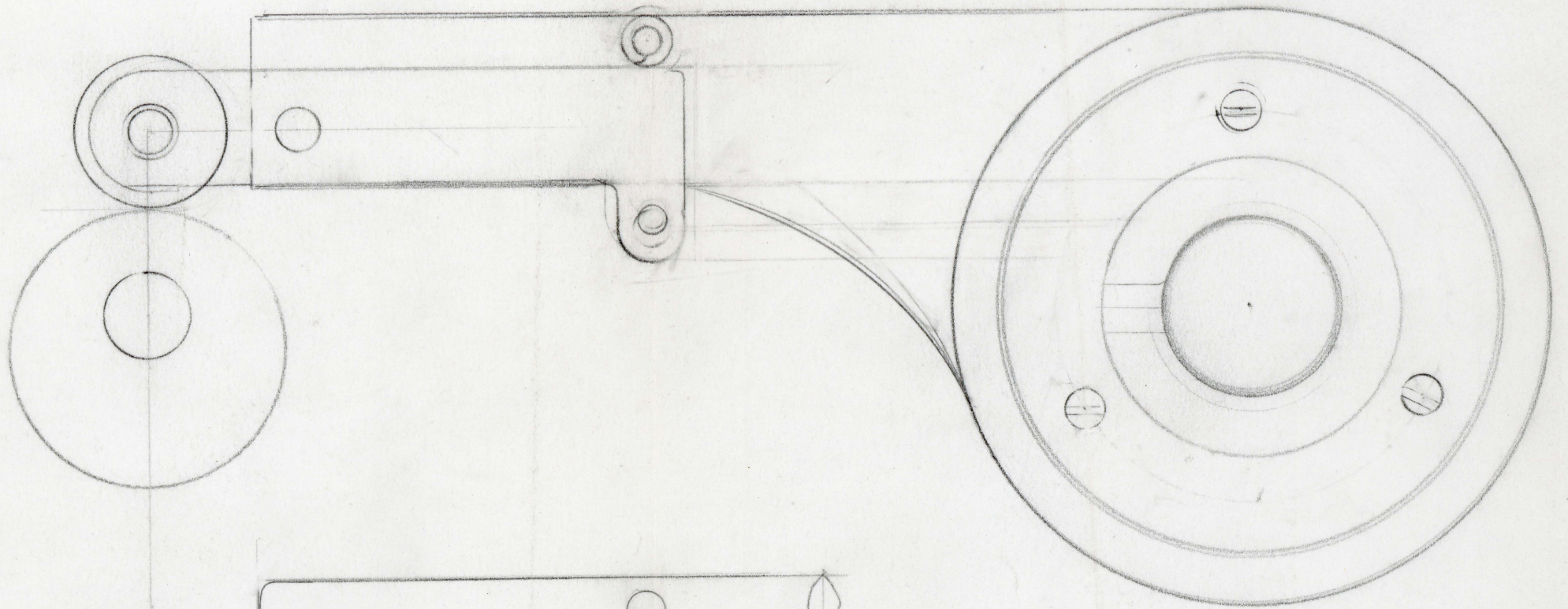
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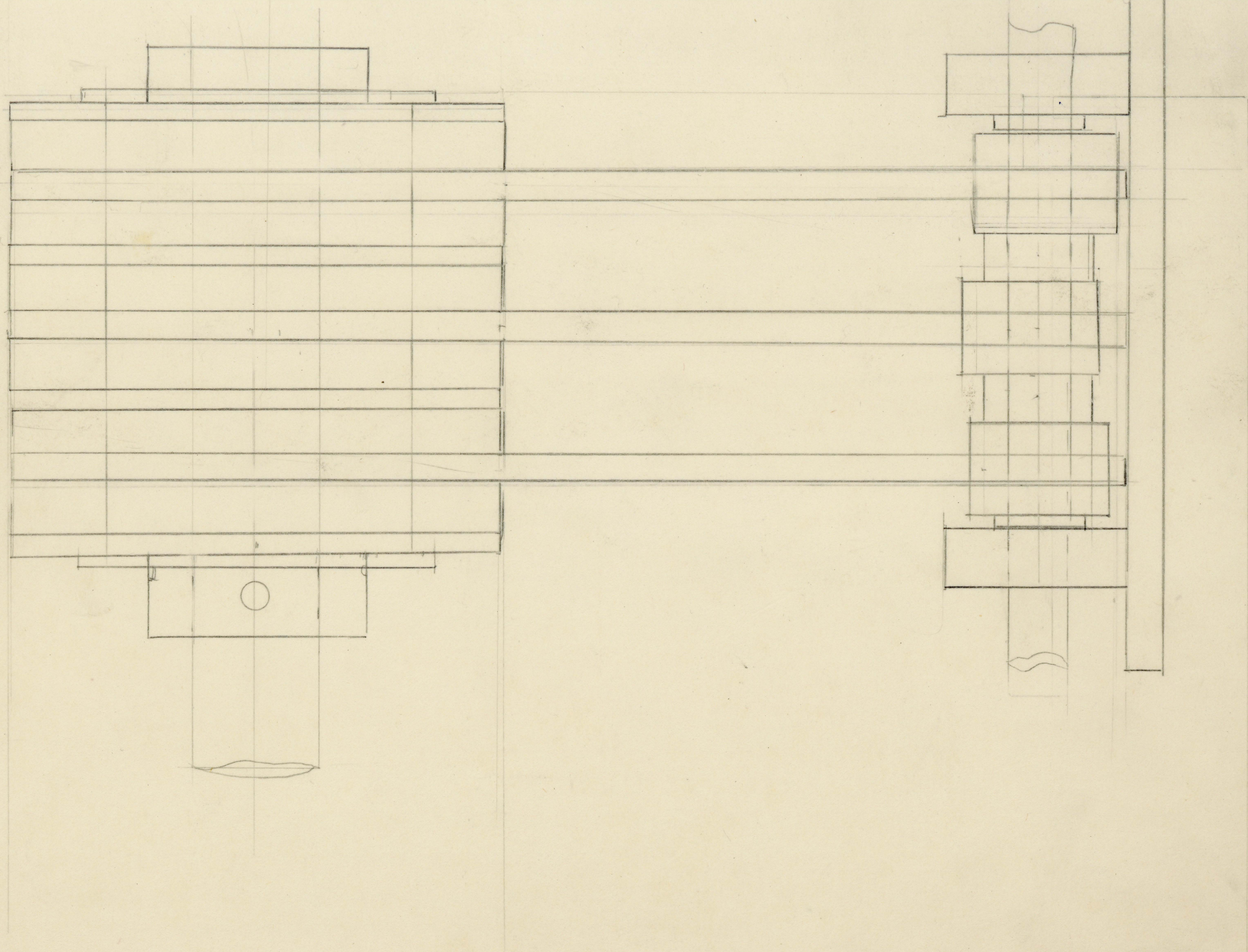


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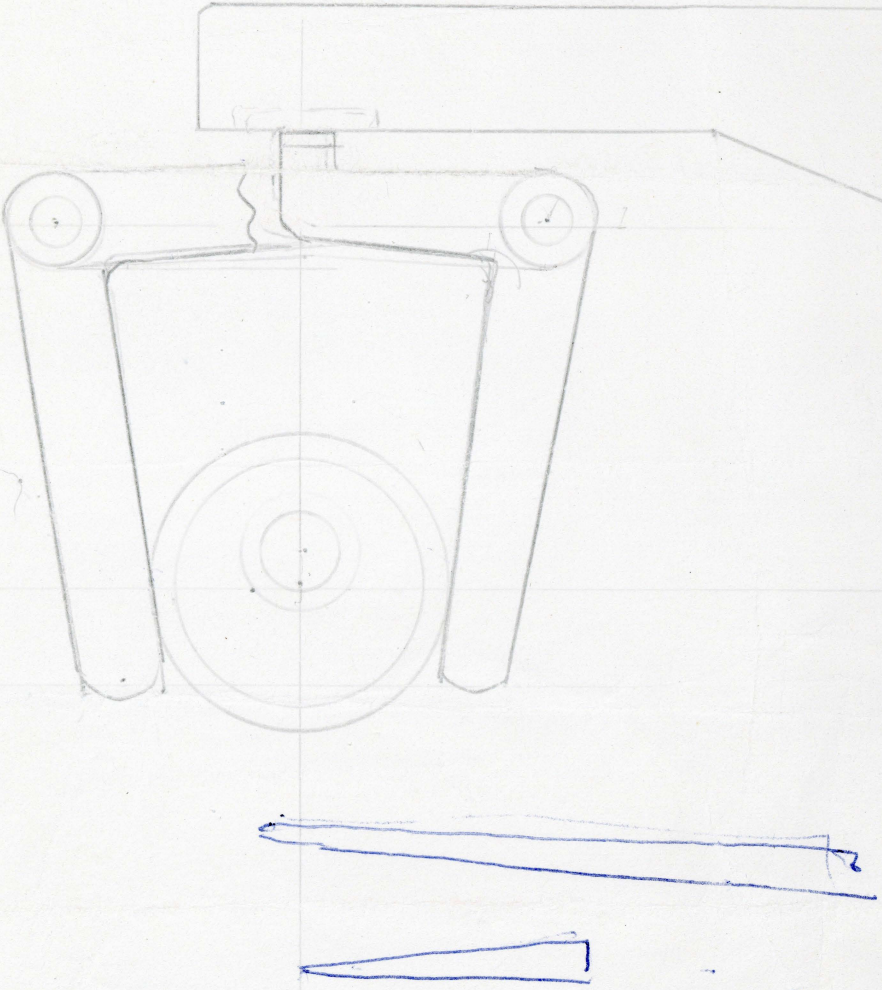


Witnessed and understood  
Edward D. Gilhooly 3/27/76

Invented by:  
2/16/76 and Dakota



10



Arvid Bakken

### Shaft Mounted Speed Reducers.

*Description.*—This type of reducer mounts directly on the shaft it is driving and is supported by the shaft. A torque-arm prevents rotation of the reducer. The input shaft may be in line with the output shaft or offset and parallel to it. When shaft is offset the torque-arm acts as a take-up to permit mounting and taking up the V-belt which frequently is used to drive the reducer. This eliminates the need for a sliding motor base. An overload release may be incorporated in the torque-arm assembly to protect the reducer. When the load becomes too great, due to jamming of a conveyor, for example, the overload release will automatically relieve the tension on the belt, shut off the motor, and give a warning signal.

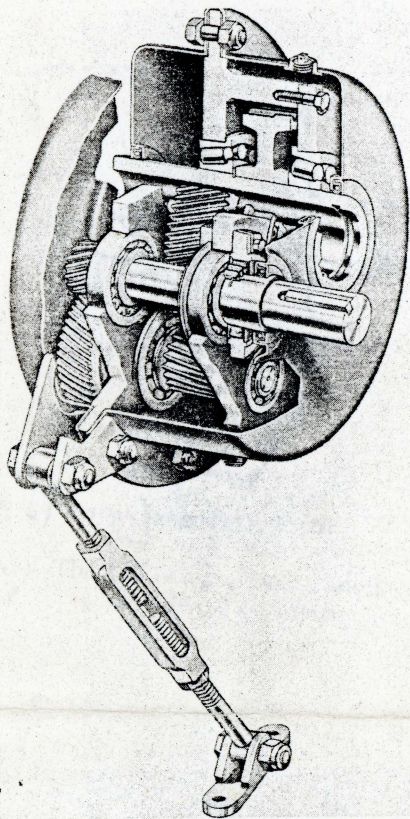


Fig. 39. Cut-away view shows clearly details of design and construction of Falk shaft-mounted drive.

The Falk shaft-mounted drive (Fig. 39) has tapered roller bearings on both the low-speed and intermediate-speed shafts. It is available for either horizontal or vertical applications of  $\frac{1}{2}$  to 125 hp, with ratios of 4:1, 14:1 and 24:1. Maximum torque rating at low speed shaft is 100,000 lb. in. A built-in backstop on high-speed shaft to prevent reverse rotation can be furnished with unit or added in field.

The Dodge Torque-Arm speed reducer (Fig. 40) is available in 5:1, 15:1 and 25:1 ratios with output speeds from 10 to 500 rpm and capacities up to 500 hp. The output shaft is offset and parallel to the input shaft. The unit mounts directly on the driven shaft, being locked to it at both sides of the reducer. The torque arm provides easy belt adjustment without use of motor rails. These reducers are furnished with or without enclosed backstop.

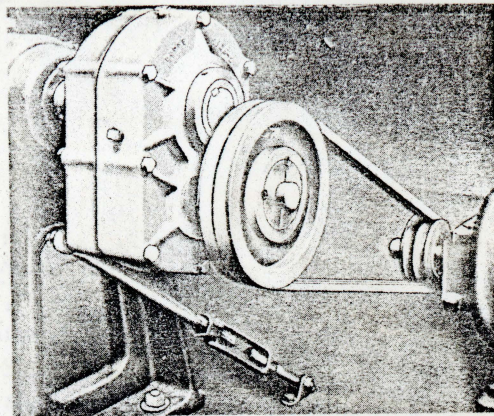


Fig. 40. Dodge Torque-Arm speed reducer.

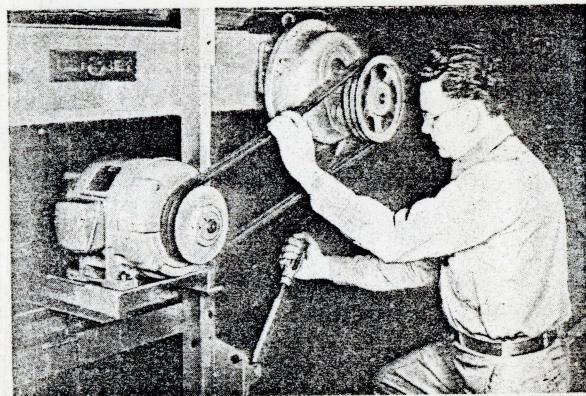


Fig. 41. V-belt tension on FMC/Link-Belt shaft-mounted speed reducer is easy to adjust.

FMC/Link-Belt shaft-mounted speed reducers are designed for direct mounting on drive shafts of equipment to be driven. They permit unlimited adaptability, since one basic unit can be used with tie rod, motor bracket, adapter, flange-mounting lugs or combinations of these accessories to meet practically any application requirement. Single and double reduction units satisfy a wide range of output speeds and horsepower requirements.

A tie rod with turnbuckle provides positive V-belt tensioning and permits quick belt changes. Motor mounting brackets can be attached directly to the reducer housing to create an extremely compact drive package. Flange-mounting lugs permit mounting on any flat surface—horizontal, vertical or inclined. For use as a screw conveyor drive, an adapter can be mounted on the trough end; this supports a motor bracket and contains a removable steel shaft and shaft seals which form an effective baffle between the reducer and the conveyor.

Other accessories which add to the reducer's adaptability include a backstop to prevent reverse rotation, hollow-shaft bushings and drive shaft to simplify mounting, and an overload release to protect valuable equipment.

Single reduction FMC/Link-Belt shaft-mounted speed reducers come in six sizes, with ratio 5 to 1 and capacities up to 50 horsepower. Double reduction units are available in eight sizes, in ratios of 15 to 1, 20 to 1 and 24 to 1, with capacities to 75 horsepower.

### Worm-Gear Reducers

*Operation.*—The worm-gear speed-reducer is a self-contained, fully-enclosed unit consisting of a worm meshing in a toothed wheel, which it turns as the driving unit is rotated (Fig. 48). As the worm turns, the continuous spiral cut on its surface engages and rolls across the teeth of the worm-gear, imparting to these teeth an action which moves them and causes the gear to rotate on its axis.

The few working parts in a worm-gear drive are an important mechanical advantage, and quietness of operation is an outstanding characteristic.

The modern worm-gear speed-reducer is entirely enclosed in an oil-tight and dirt-proof housing. It is self-lubricating, simple in construction, and occupies a small amount of space.

Single reduction and helical-worm units transmit power at right angles and have either horizontal or vertical output shafts.

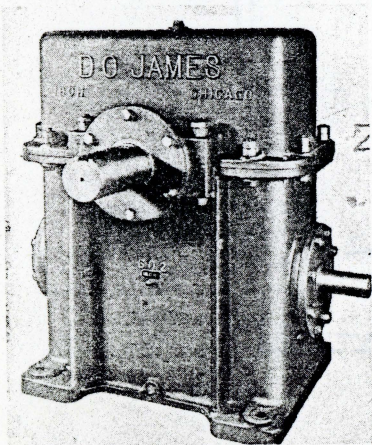


Fig. 53. Worm-gear speed reducer.

*Characteristics.*—The following points summarize the characteristics of worm-gear speed-reducers:

- (1) Drive.—Right angle.
- (2) Operation.—For either intermittent or continuous heavy-duty service.
- (3) Temperature.—Worm-gear units will operate in practically all temperatures; however, it is advisable to consult the manufacturer for recommendations when exceptionally low or high temperatures are encountered.
- (4) Efficiency.—When hardened and ground worms and bronze gears are used the efficiency, after the running-in period, will be approximately 96 per cent, for ratios below 10 to 1; 90 per cent. for ratios of from 10 to 1 to 1 to 25; and 83 per cent. for ratios of from 25 to 1 to 40 to 1. For a reduction of 100 to 1 the efficiency would be approximately 75 per cent. Very low speeds and cold starting will materially affect the efficiency.
- (5) Economy.—The helical-worm unit generally is more economical than the single-worm reduction unit because it will transmit more power. For ratios of reduction up to about 25 to 1, the single worm reduction is normally a better selection because it is sturdier than the helical-worm combination, and there is not enough difference in efficiency to make any practical difference.

Helical gear sets are used for the primary stage of a double reduction combination, to obtain higher ratios, but their main function is to increase the range of reduction obtainable with a right angle drive.

(6) Motor Speeds.—The majority of all worm gear reduction units operate at 1,800 rpm. Better lubrication and better cooling of the gearing is obtained when the worm is immersed in an oil bath, thus favoring worm gear location below the wheel, except for low ratios in large units or where speeds are appreciably over 1,800 rpm.

(7) Noise.—Quiet at usual motor speeds and more quiet than almost any other gearing.

(8) Shaft Projections.—Single or double input or output shaft projections can be furnished. On vertical type worm-gear units the output shaft can project upward or downward, as on agitators.

(9) Reversing.—Very suitable for sudden reversing, as in trucks, tractors, and certain types of conveyors.

(10) Advantages.—Free from vibration and usually self-locking when ratios of 40 to 1 and greater are used. A solenoid brake is preferred, however, for stopping and holding the load at a definite point.

*Types.*—The worm-gear speed-reducer is made in three basic types: (1) with the worm below the gear; (2) with the worm above the gear; (3) with the gear shaft vertical.

The worm is generally integral with the high-speed shaft. The center-to-center distance between the worm shaft and the gear shaft determines the size of the unit.

The best transmission results when the gear is of bronze and the worm shaft is of a case-hardened, low-carbon alloy steel.

The modern worm-gear reducer in certain types is made for direct coupling to the driven load, but in other applications the diameter of the output shaft allows the use of an overhung pinion or sprocket. Chain drives may be used to provide flexibility between reducer and driven machine.

*Load Characteristics.*—The characteristics of the load to be carried are an important factor in selecting the proper worm-gear reducer. The characteristics of the load do not affect the worm shaft, as it transmits mainly torque, but they do affect the gear shaft and its bearings. The gear shaft carries a torque load and, often

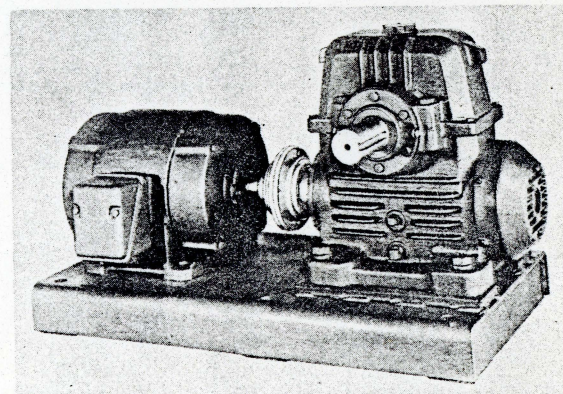
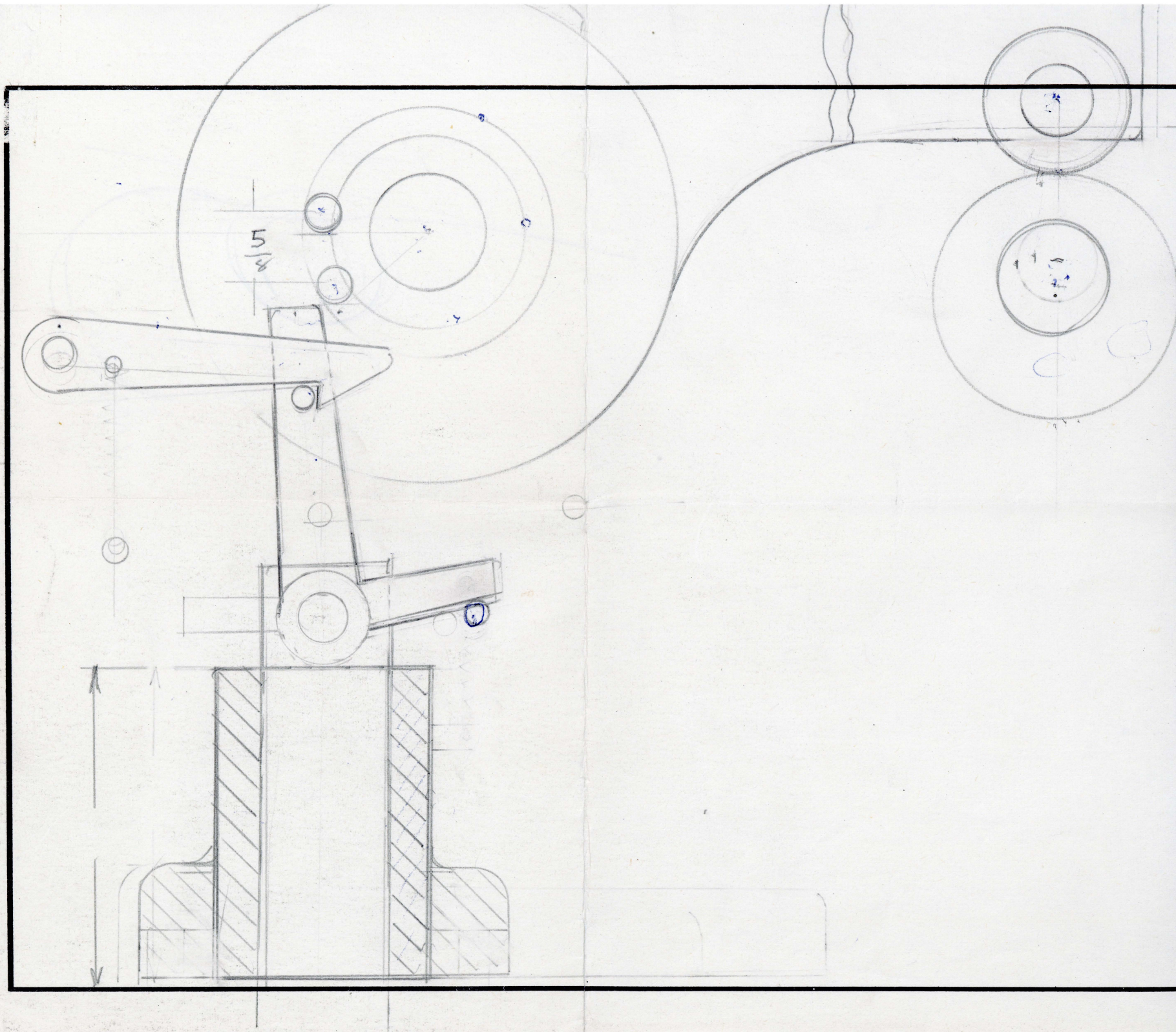
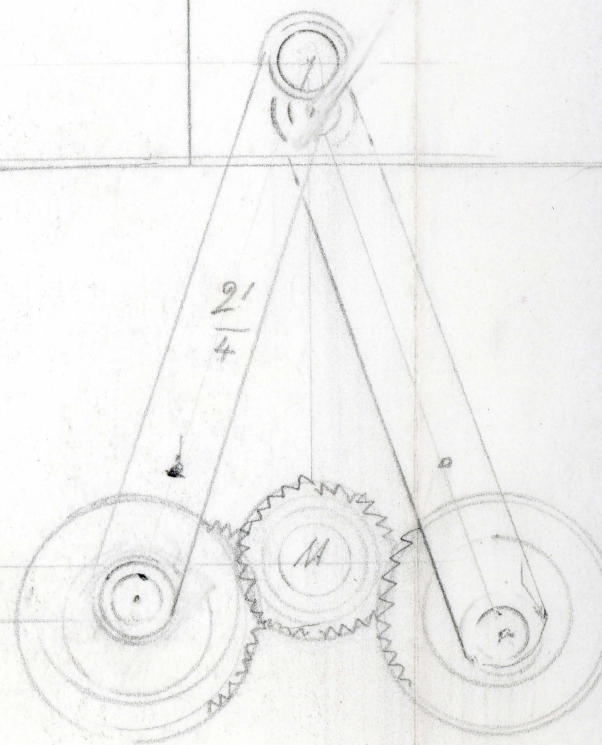
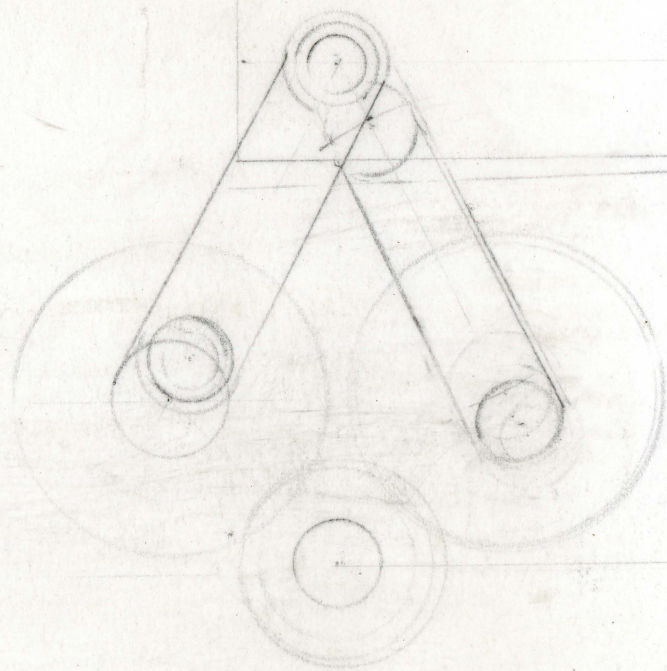
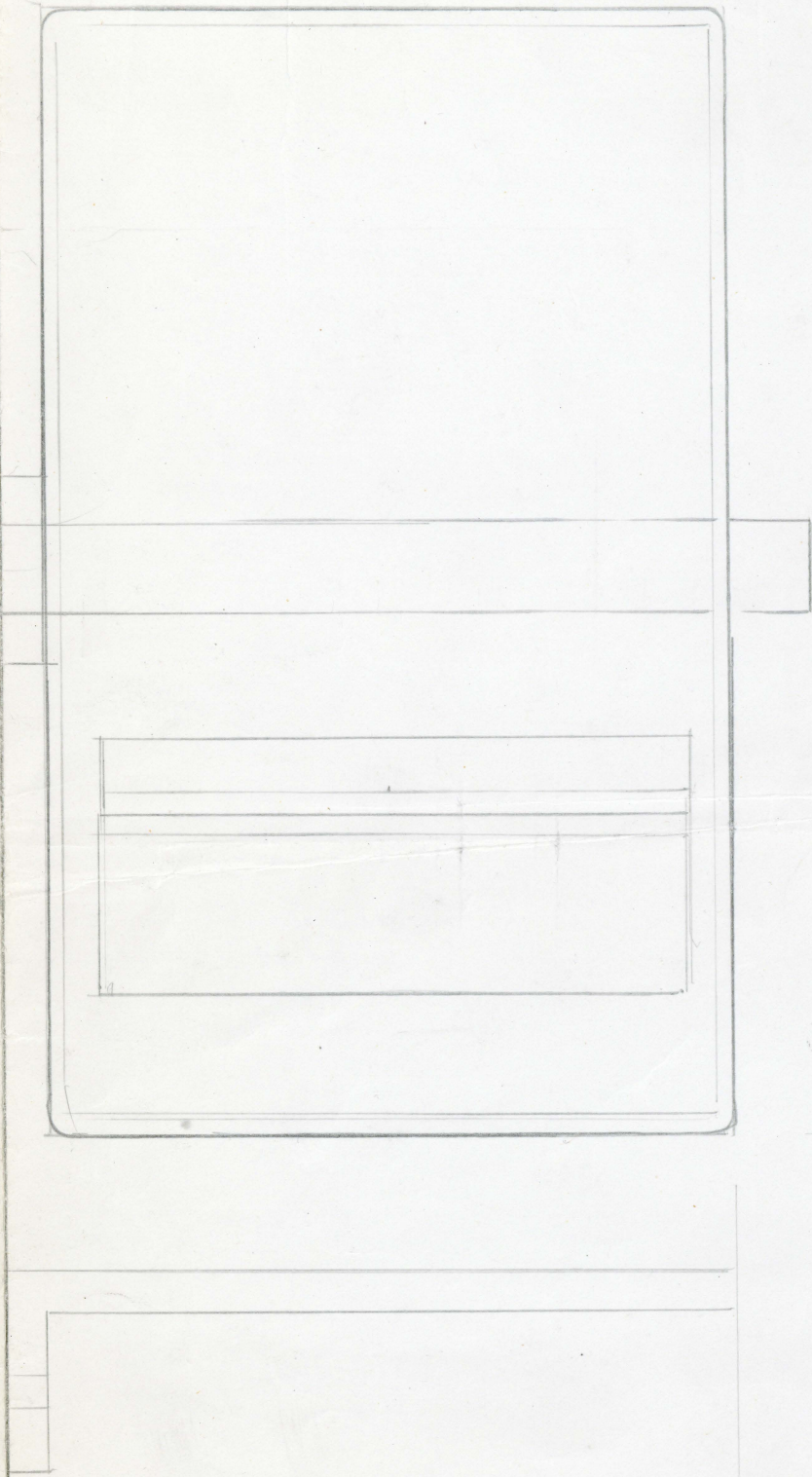
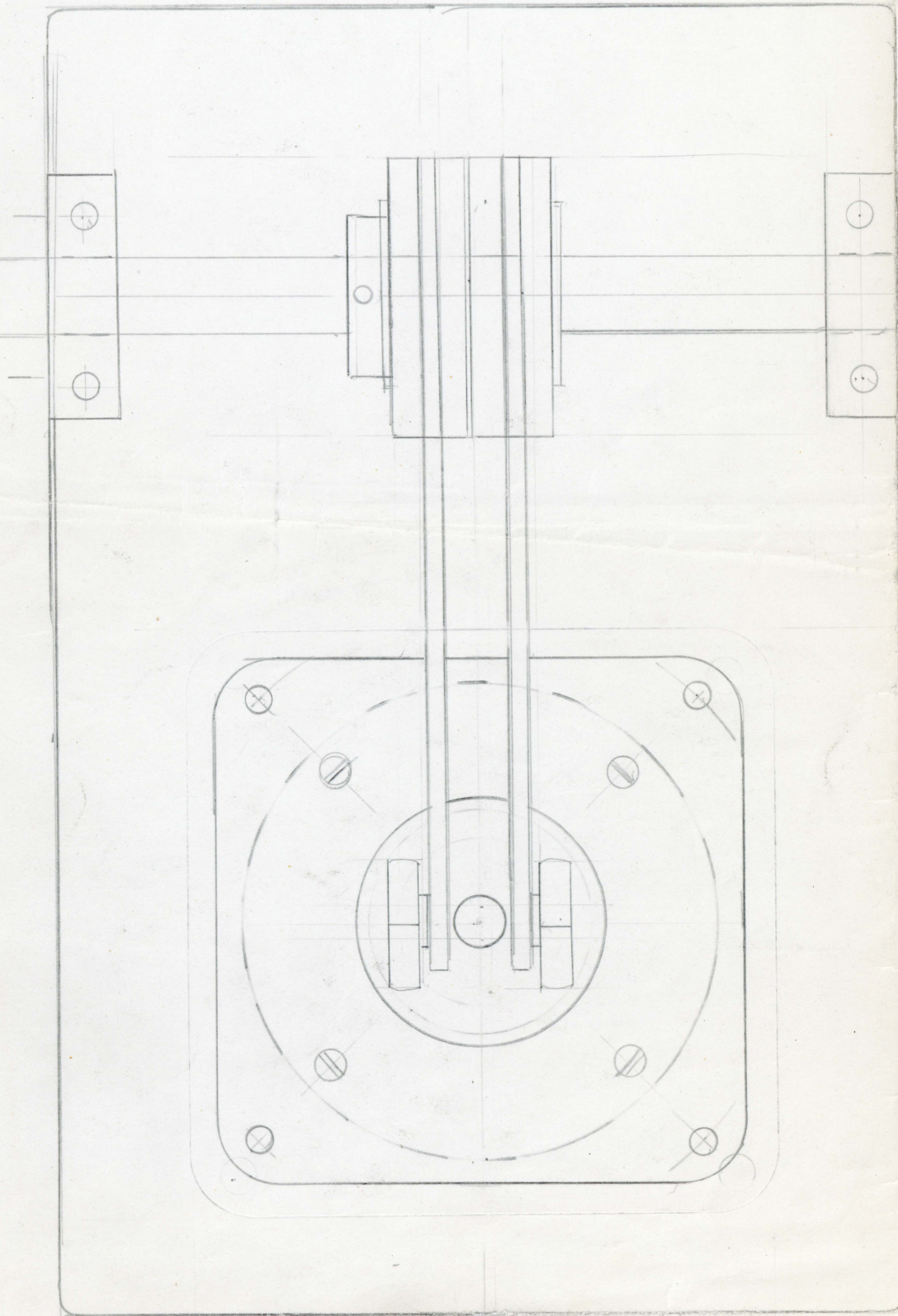
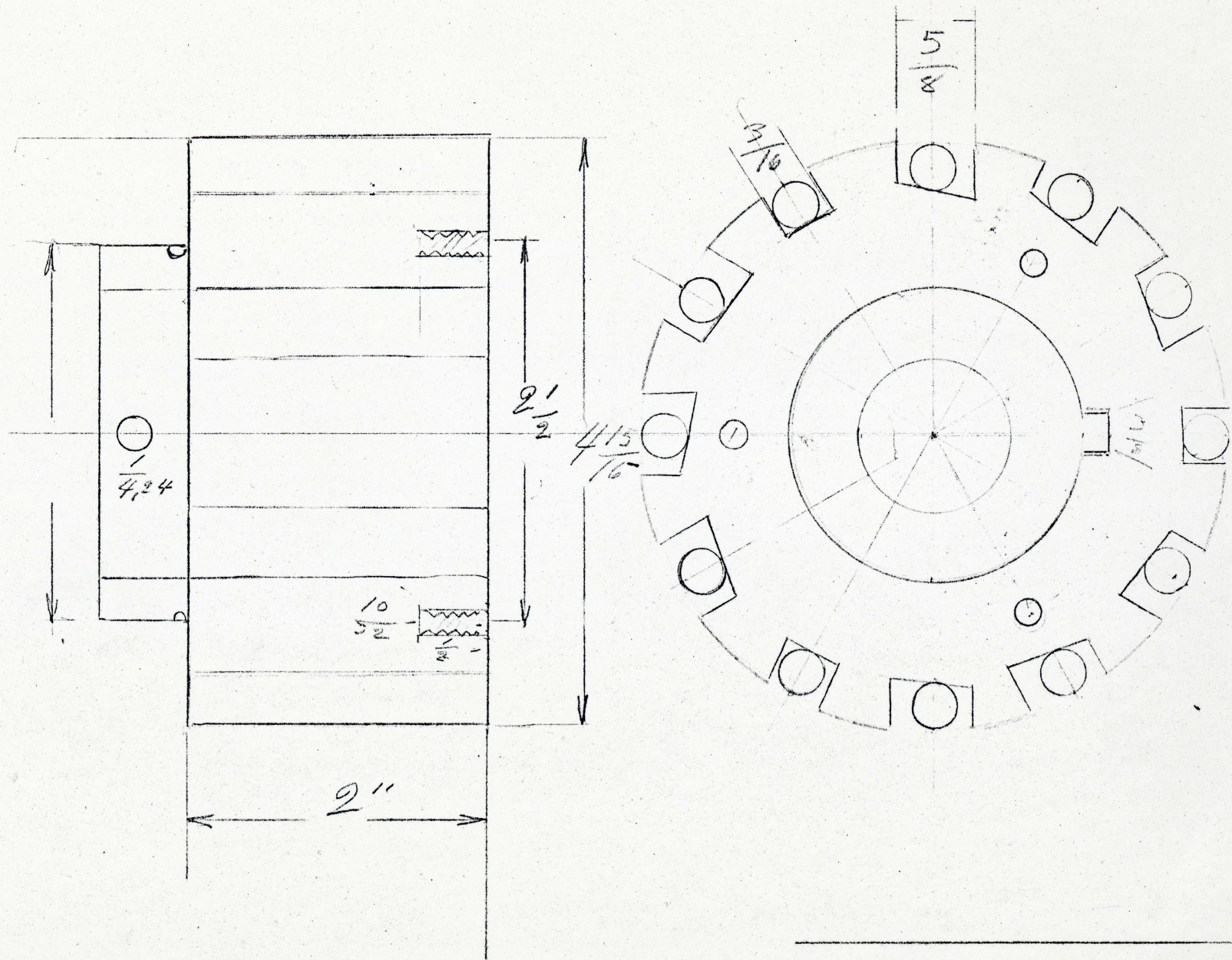


Fig. 54. Link-Belt fan-cooled, right-angle speed-reducer can be connected direct to driven machine or mounted alongside and transmit power through chain drive.









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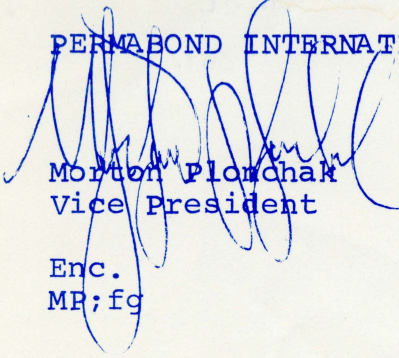
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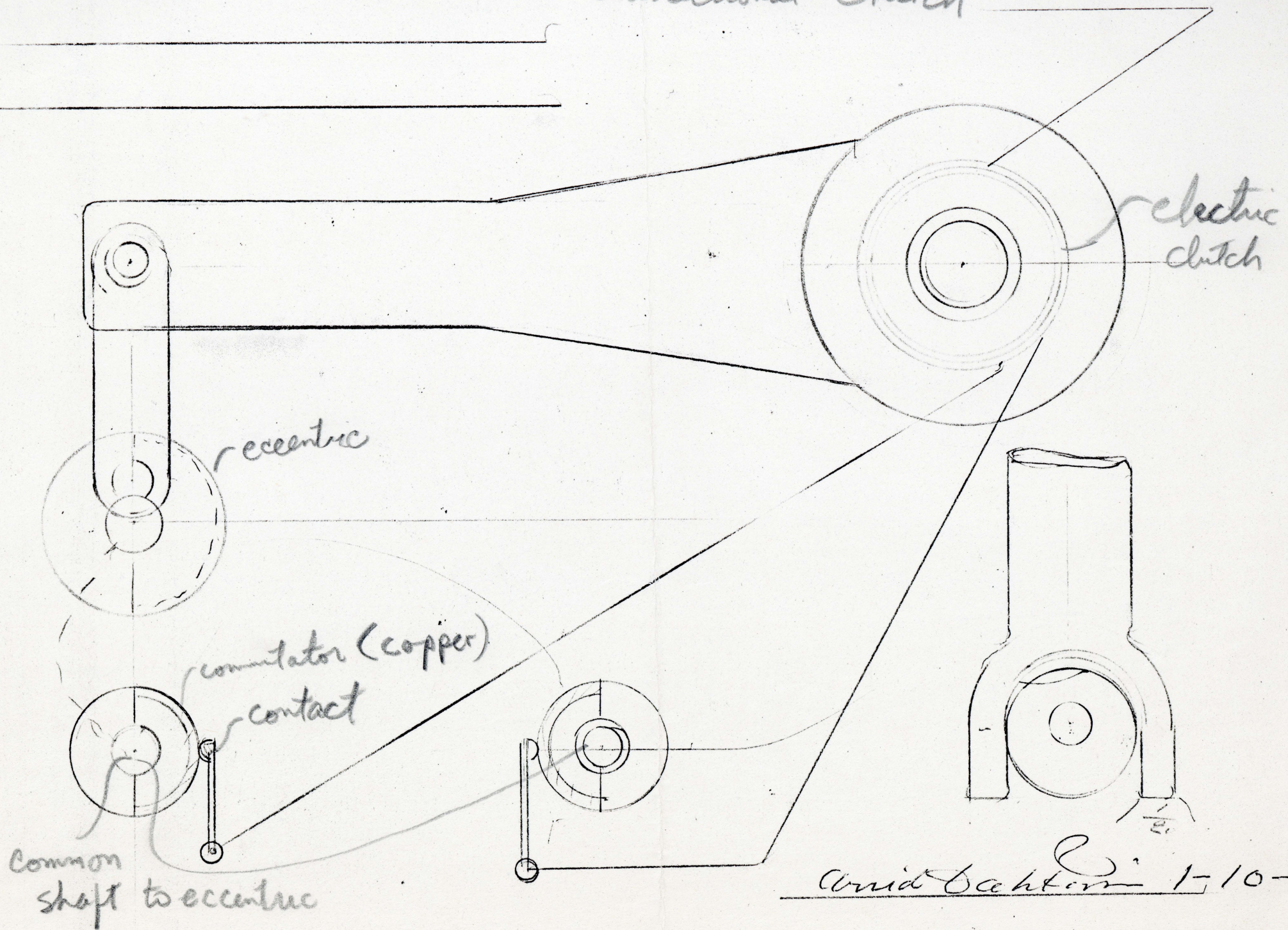
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Vice President

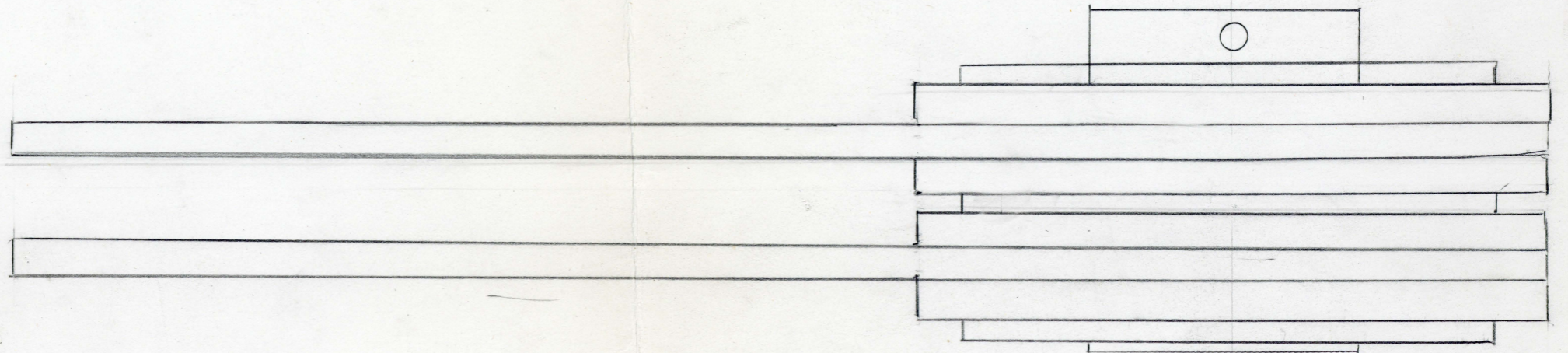
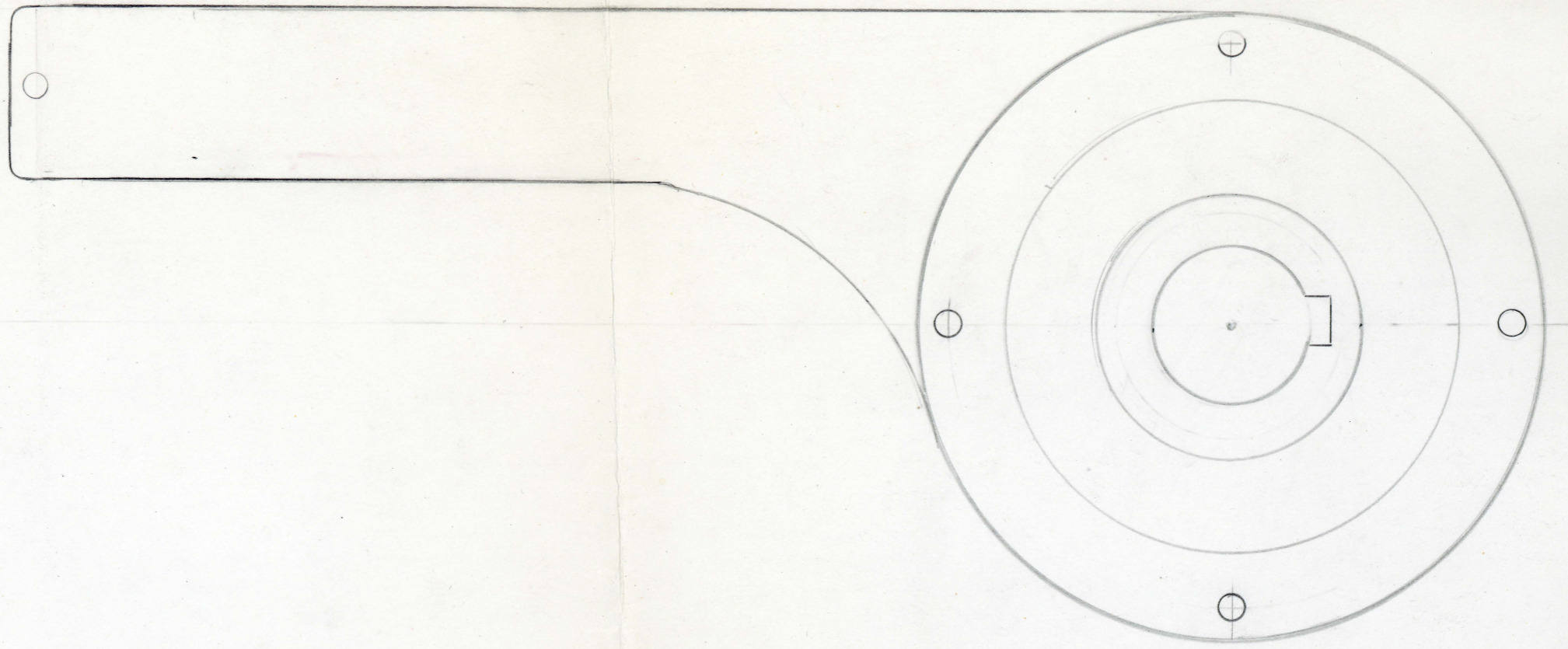
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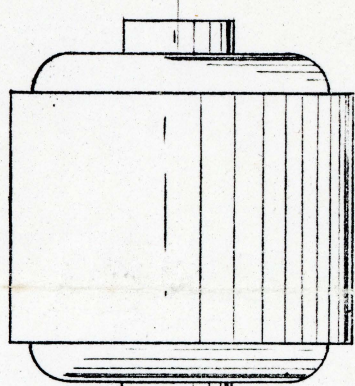


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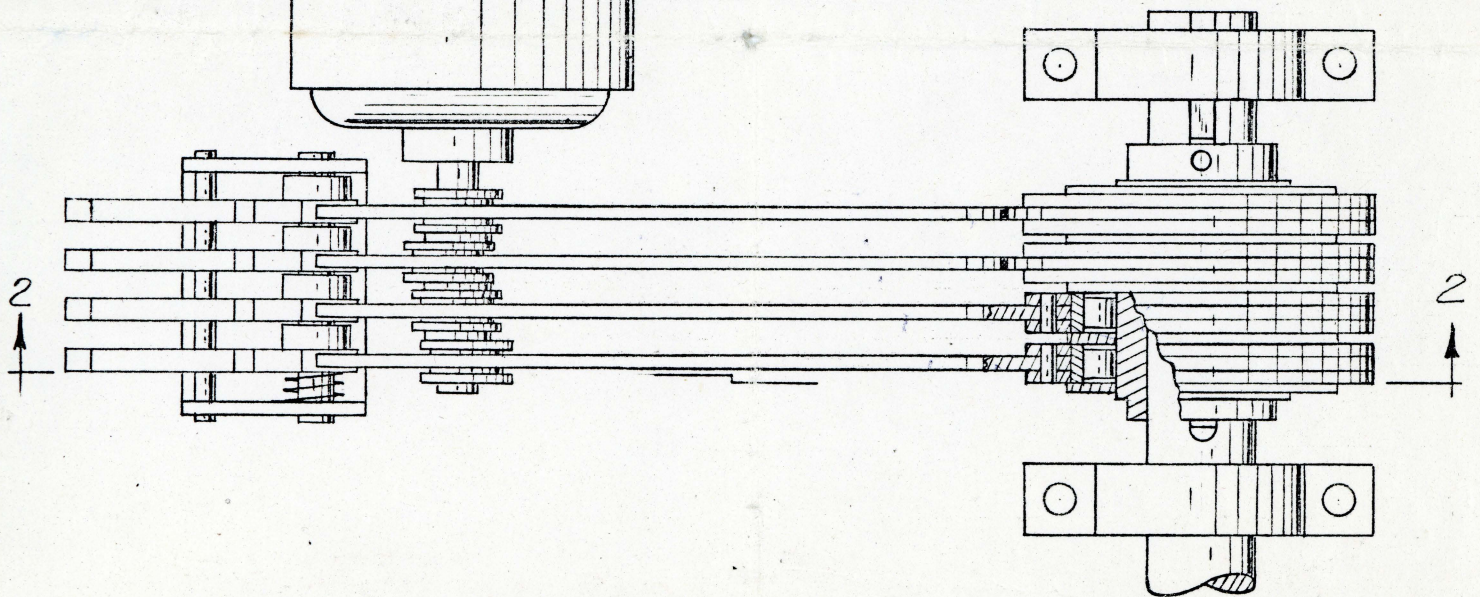


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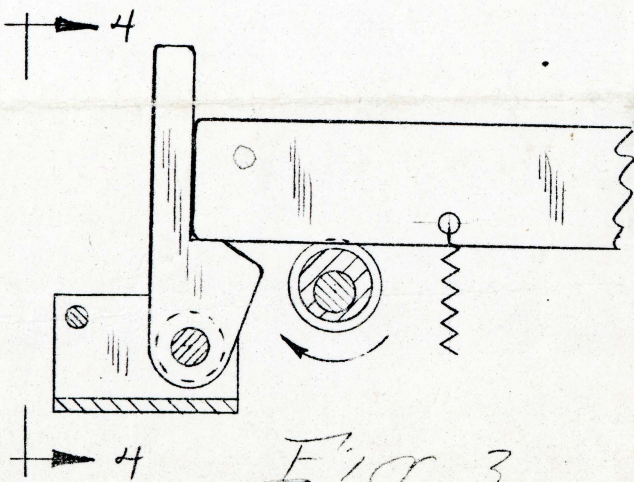
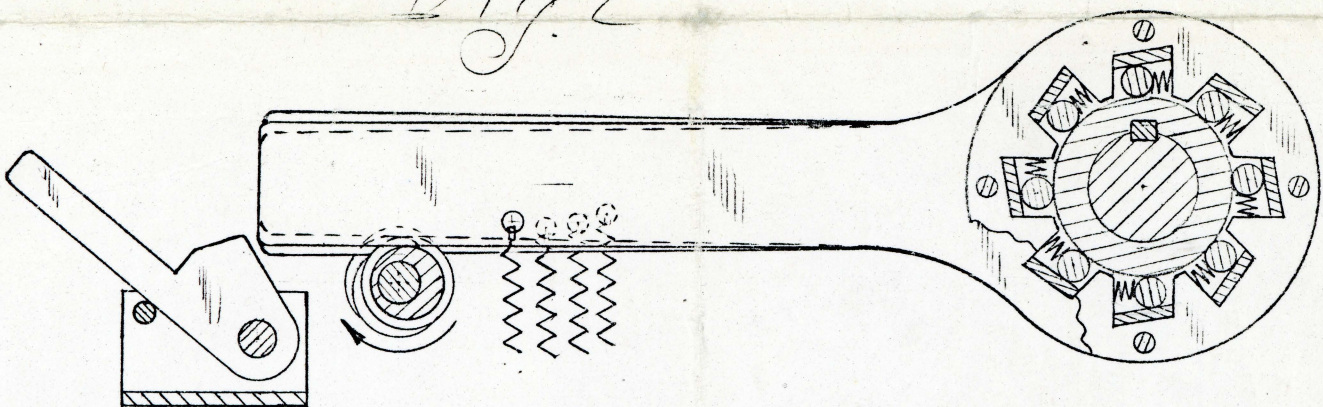


Fig. 3

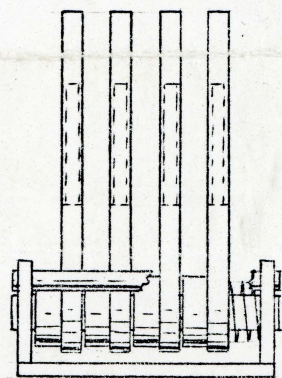
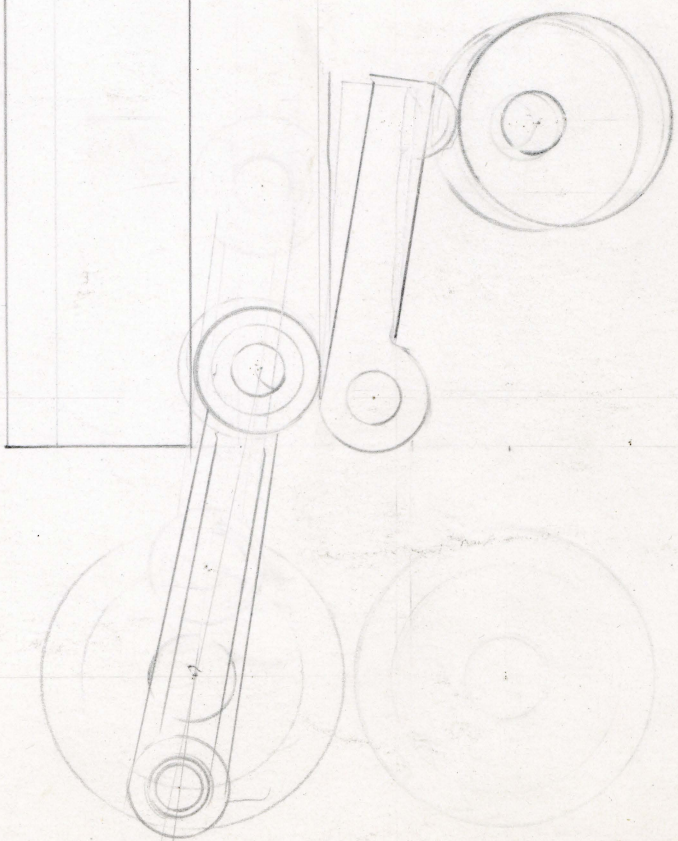
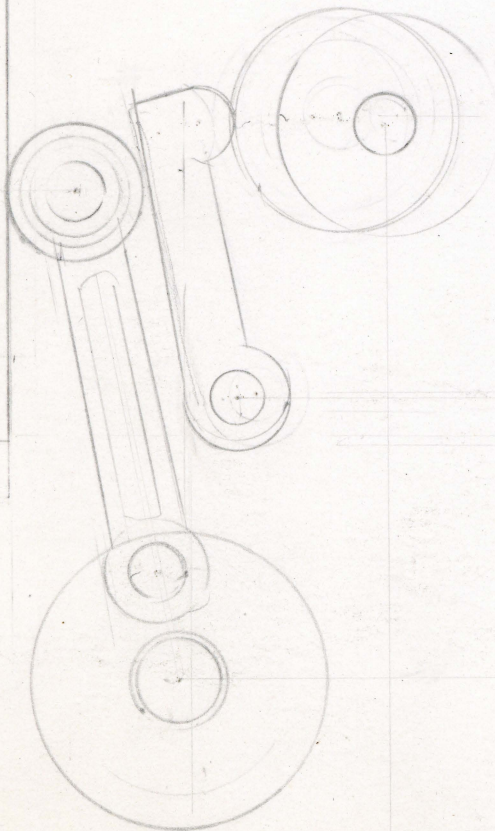
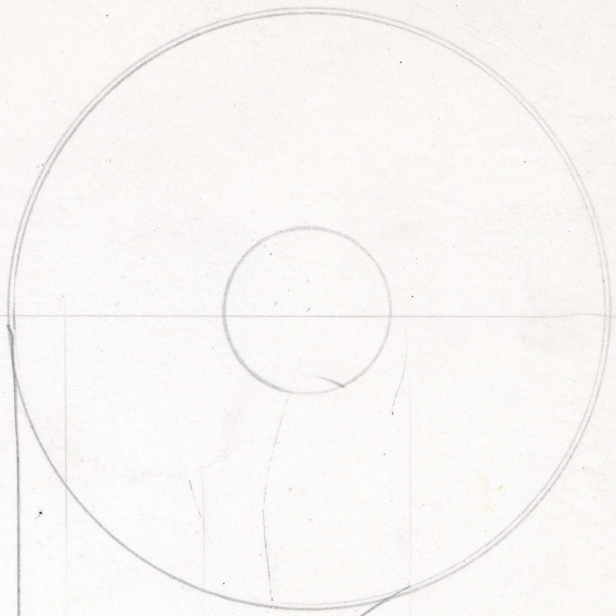
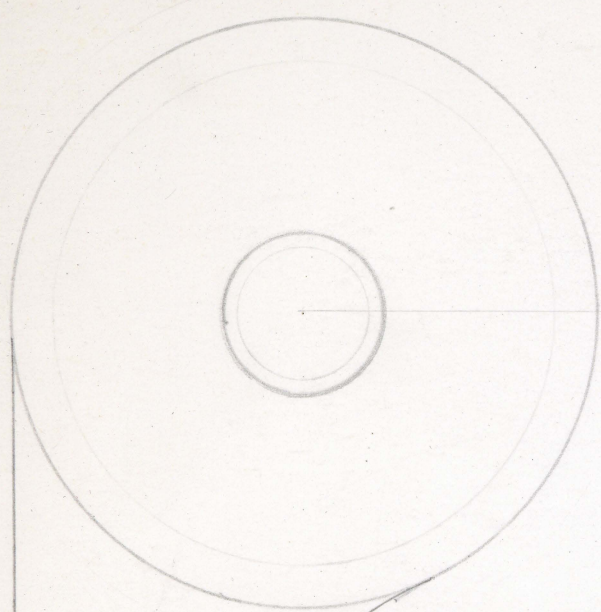
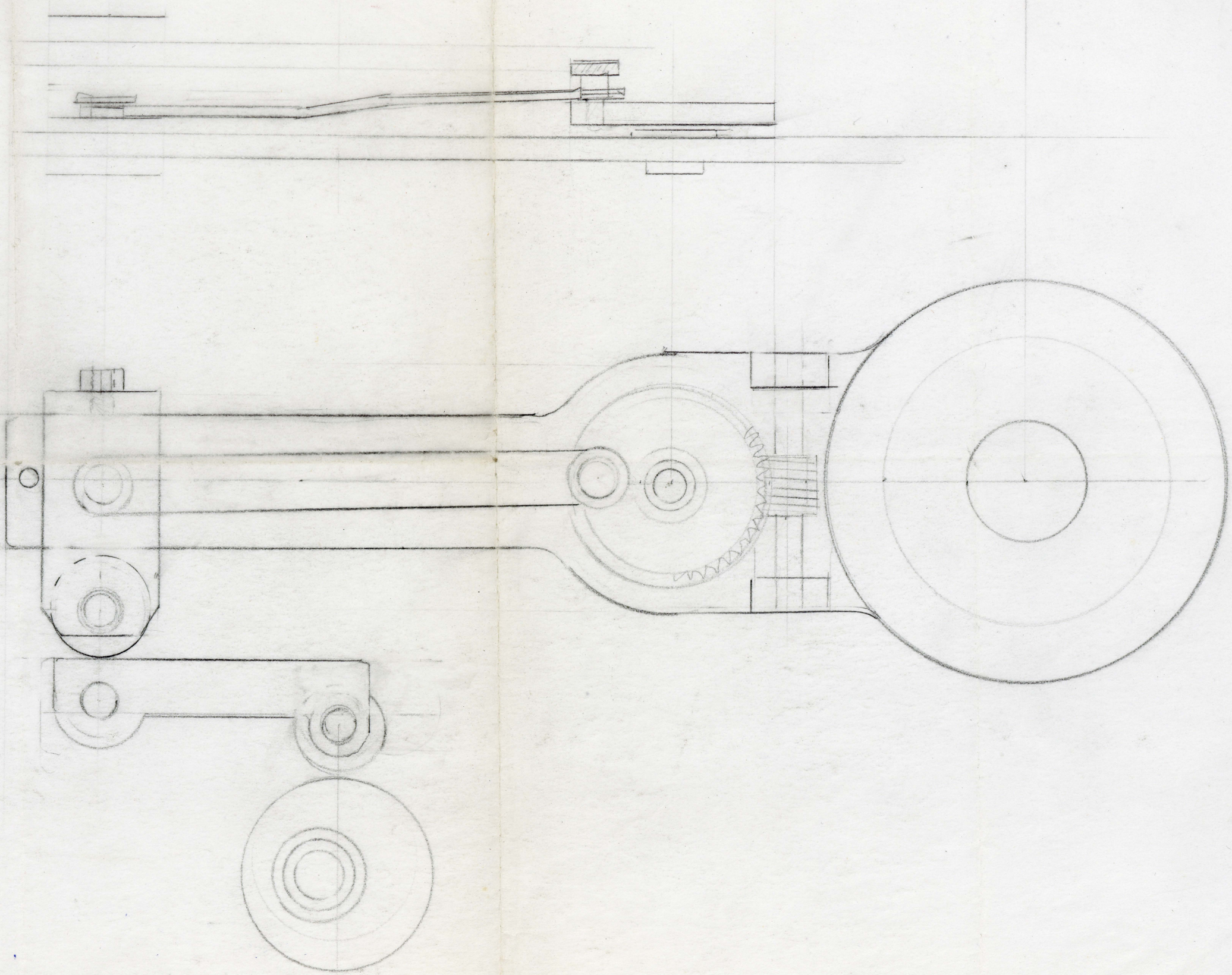
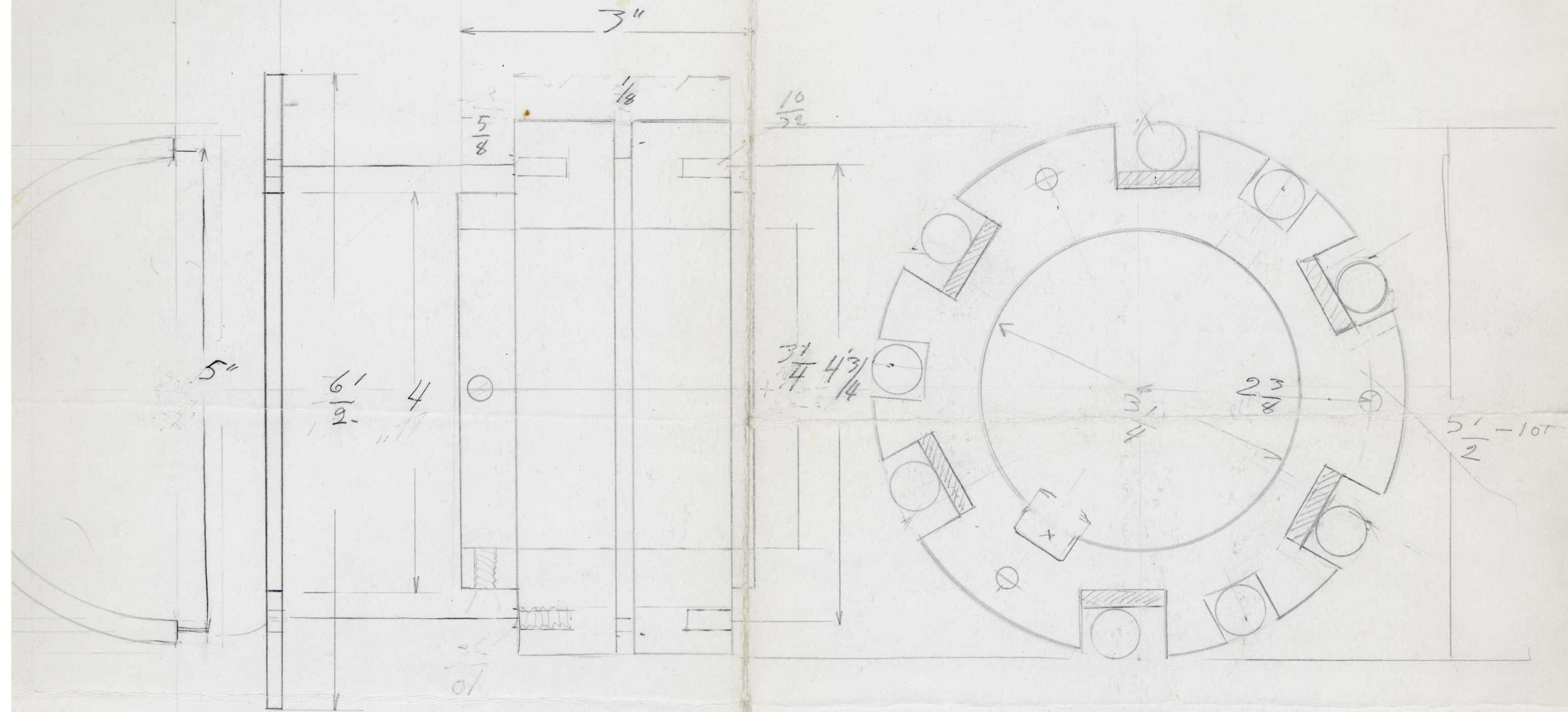


Fig. 4





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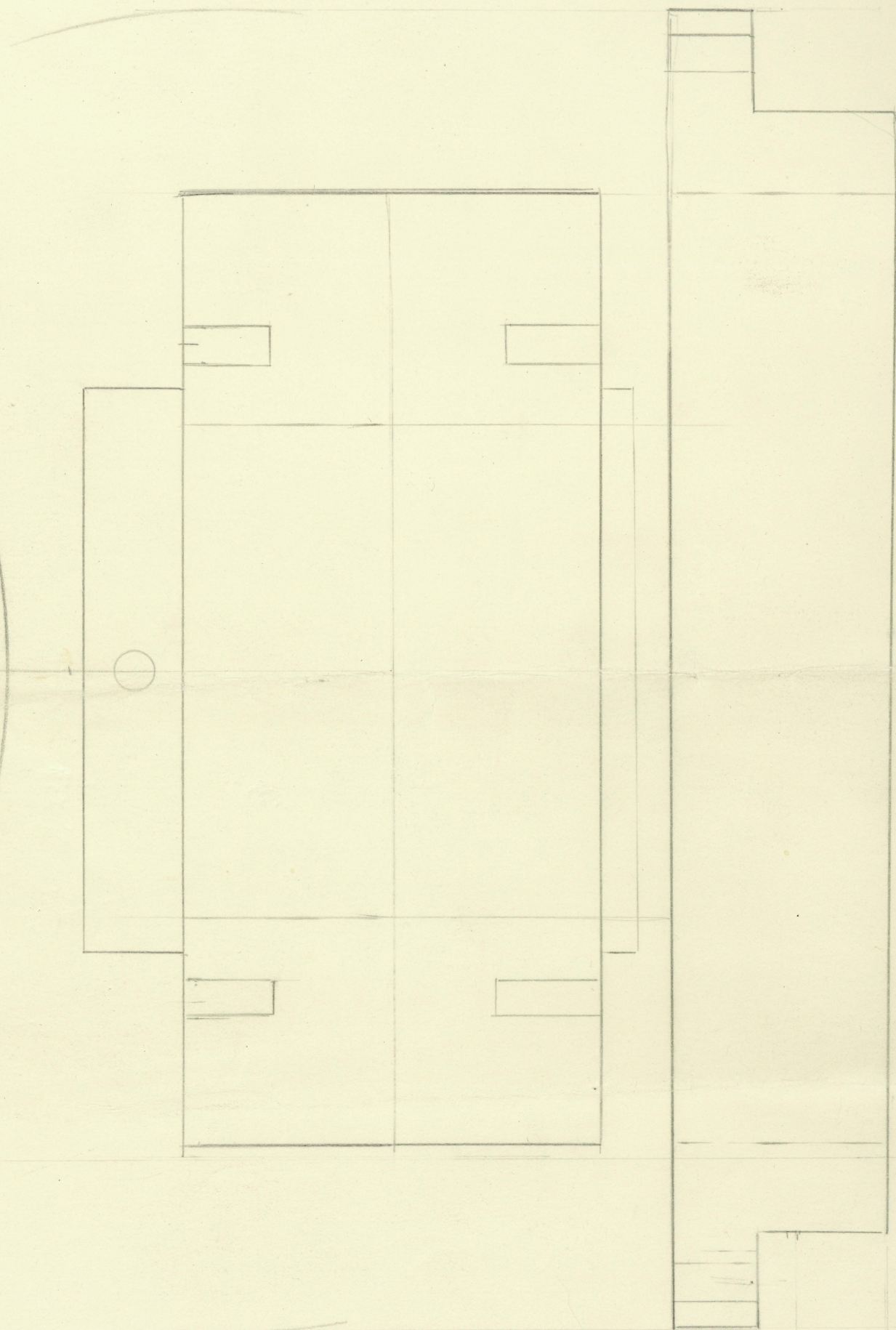
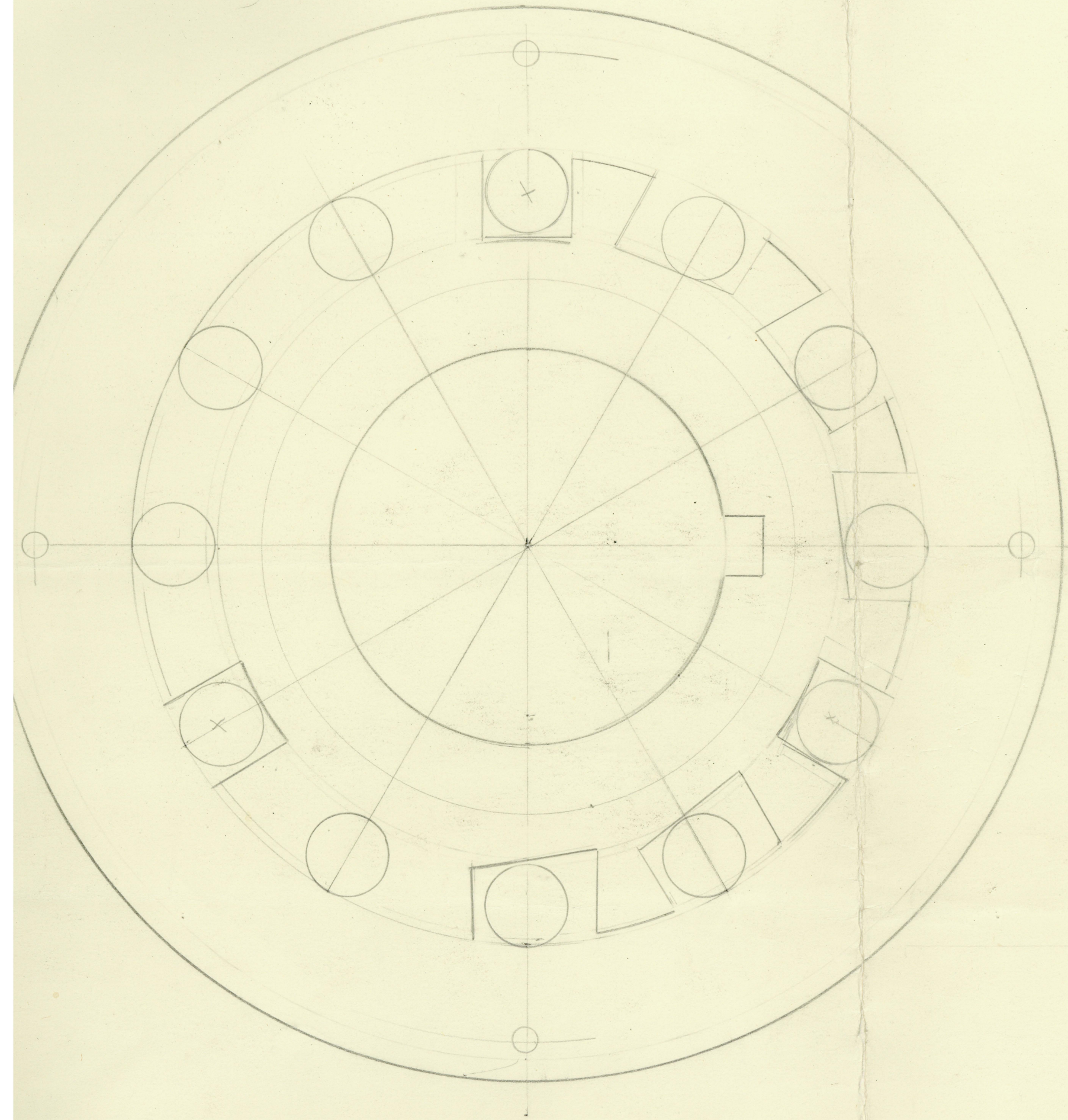



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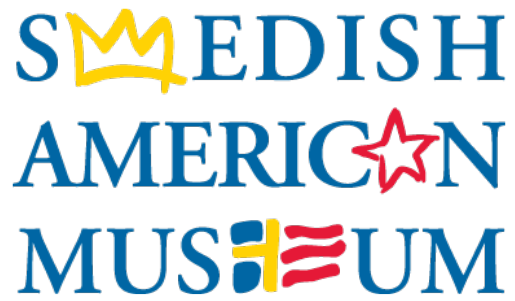
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