

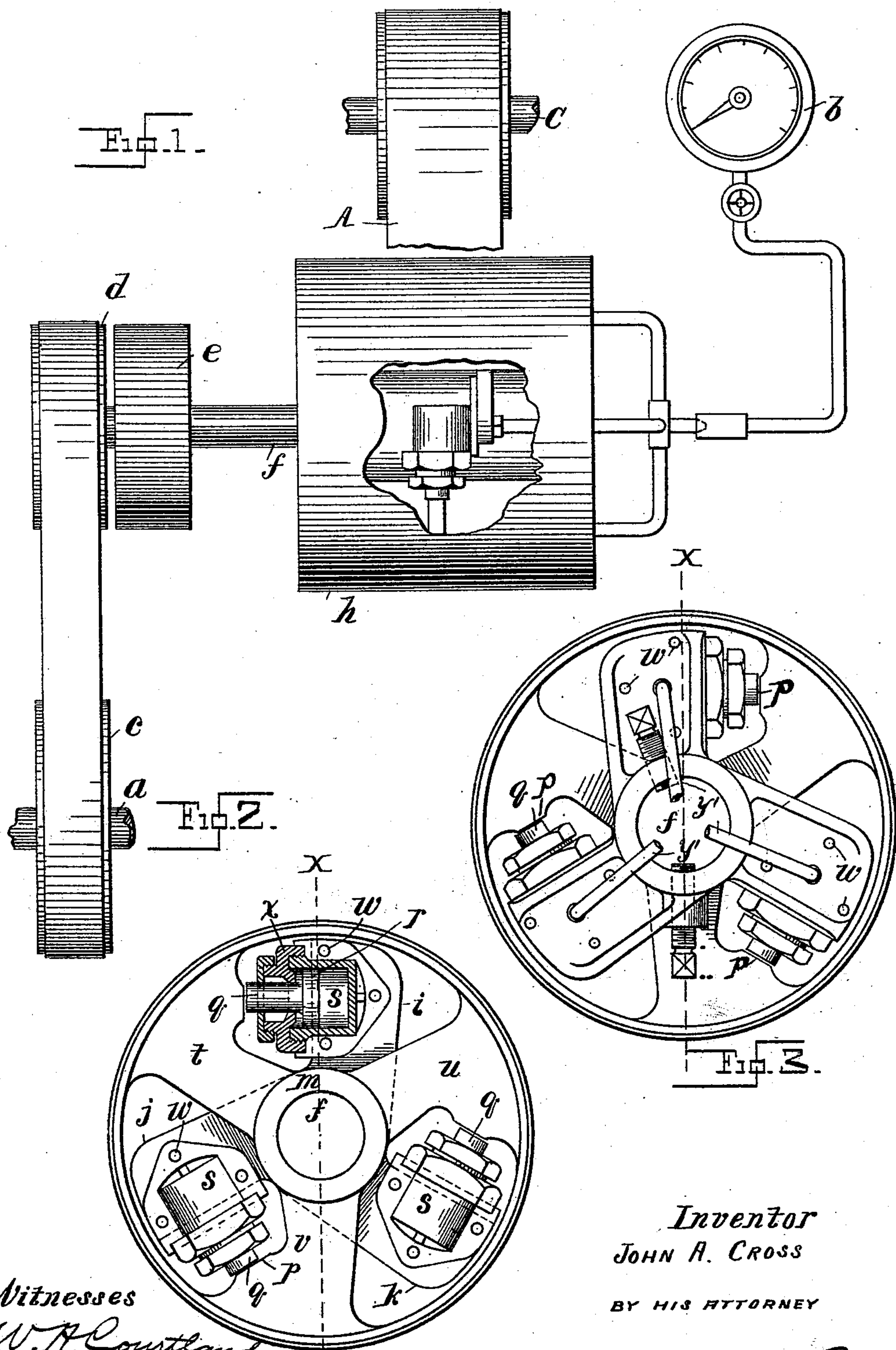
(No Model.)

2 Sheets—Sheet 1.

J. A. CROSS.
DYNAMOMETER.

No. 517,439.

Patented Apr. 3, 1894.



Witnesses
W. H. Courtland
Nellie L. Pope.

Inventor
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BY HIS ATTORNEY

Edward P. Thompson

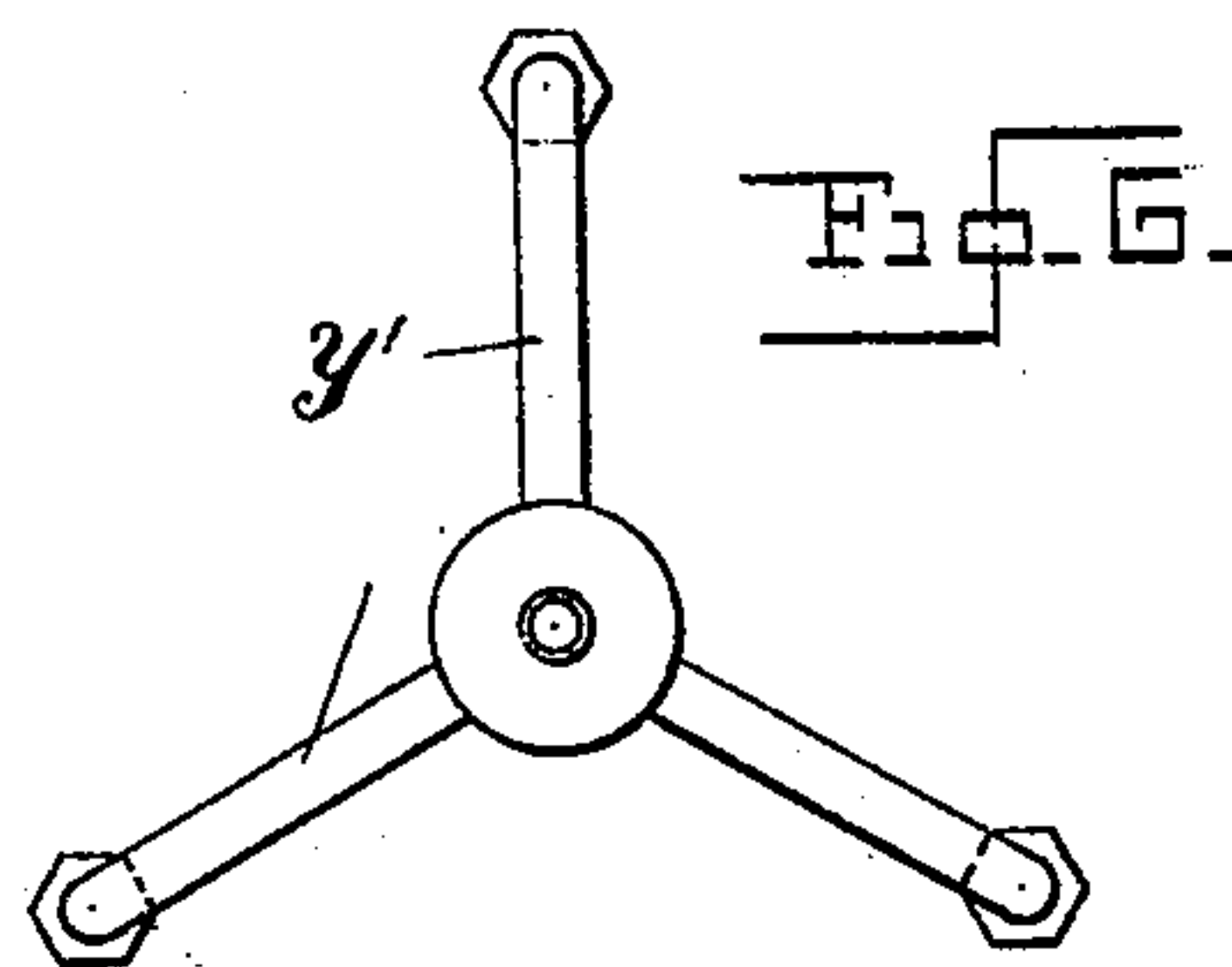
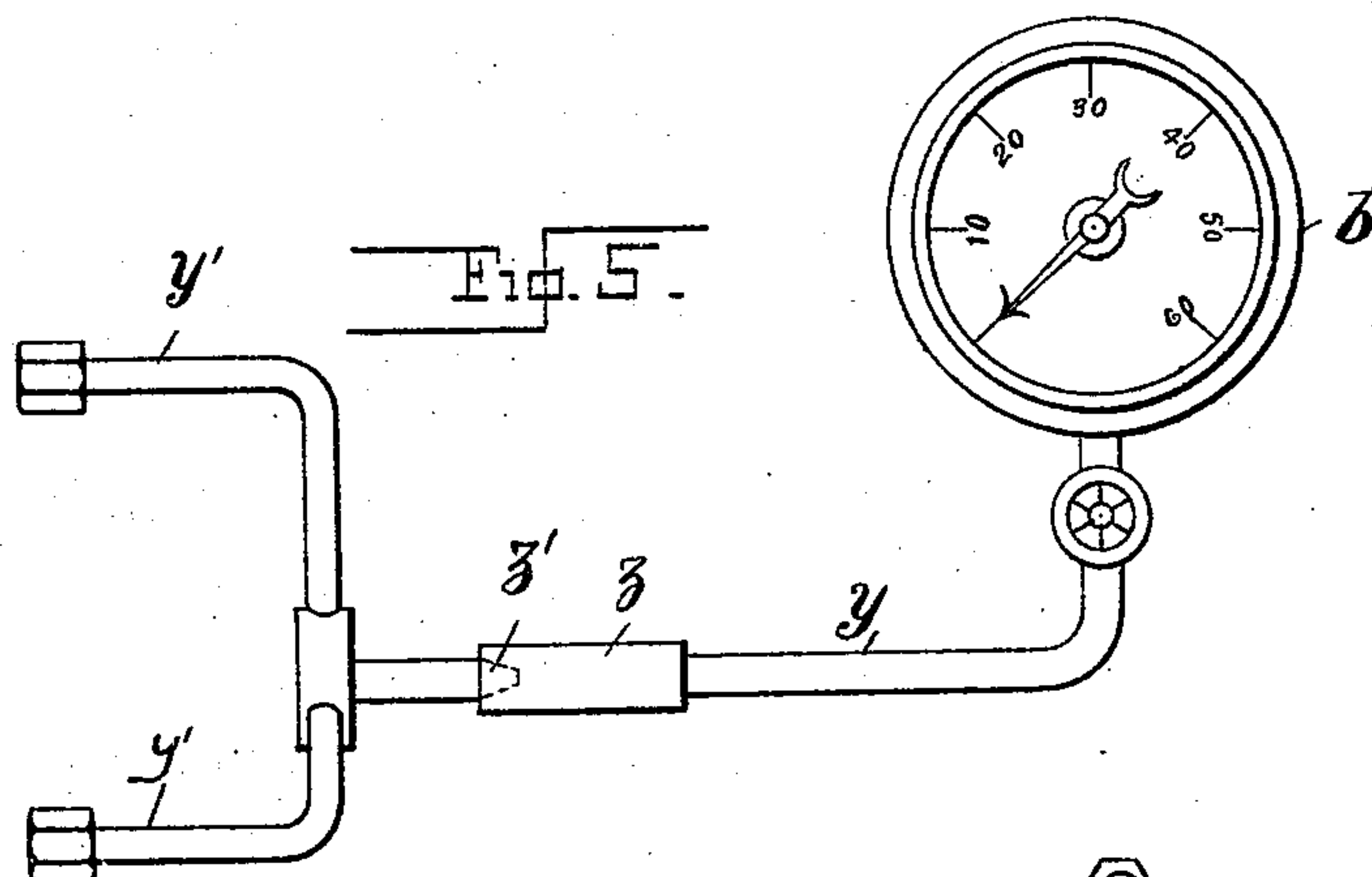
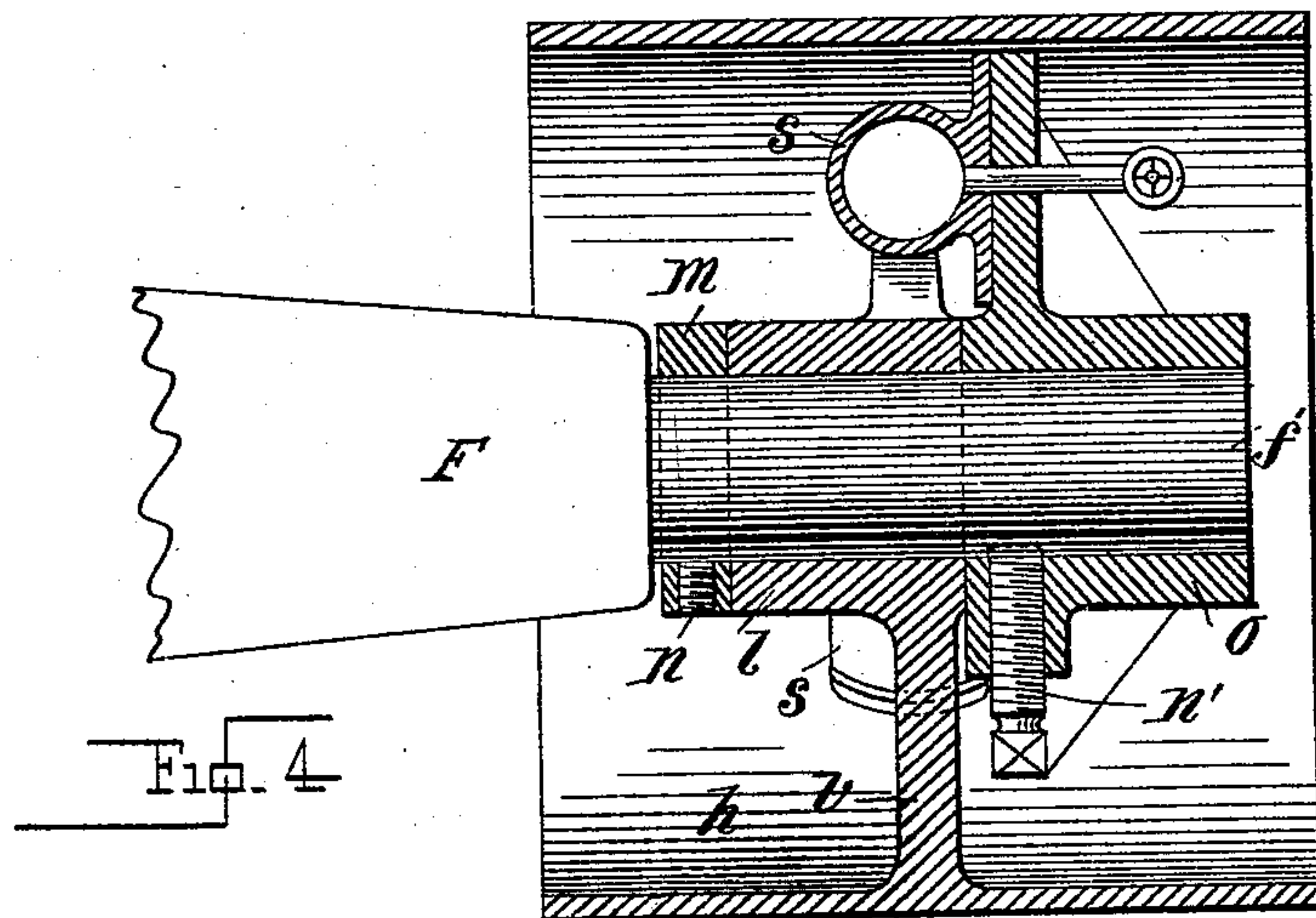
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2 Sheets—Sheet 2.

J. A. CROSS.
DYNAMOMETER.

No. 517,439.

Patented Apr. 3, 1894.



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UNITED STATES PATENT OFFICE.

JOHN A. CROSS, OF NEW YORK, N. Y.

DYNAMOMETER.

SPECIFICATION forming part of Letters Patent No. 517,439, dated April 3, 1894.

Application filed March 18, 1892. Renewed January 20, 1894. Serial No. 498,154. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. CROSS, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Dynamometers, of which the following is a specification.

The object of my present invention is to provide a dynamometer which can easily be applied directly to the shaft of any machine in the place of the usual pulley, or can, if preferred, be used in connection with bolts which respectively connect the dynamometer to the prime mover and working machine.

Another important object of the invention is to accomplish compactness in construction and rapidity of operation in getting results. The organization is such that by the use of a fluid, preferably, a liquid, such as oil, the driving force causes the liquid or air to be compressed, and the pressure is communicated by means of pipes containing the fluid, to a gage adapted to indicate degrees of pressure or horse power.

The invention in all its accuracy of detail of construction, is set forth by the assistance of drawings, in order that any one versed in the art may construct and use the same.

Figure 1, is a plan of the various parts of the system needed in order to explain the complete operation of the device when in practical use. Parts are broken away. Fig. 2, is a front elevation of the complete invention, independently of the belts, couplings and other appurtenances necessary in order to operate the device in connection with a prime mover. In this elevation, part of the upper portion is shown in section in order to avoid the unnecessary multiplication of figures. Fig. 3, is a reverse elevation of that which is shown in Fig. 2, some of the minor details being broken away. Fig. 4, is a vertical section of the device shown in Figs. 2, and 3, on the line X. It will be noticed that the section is not accurately on this line and that in the three views Figs. 2, 3, 4, all parts are not always included, as for instance, the set screw, seen in Fig. 2, and the bearing shown in Fig. 4, are not shown in Figs. 3, or 2. Fig. 5, is a full view of the pipes leading to the gage which is also shown. Fig. 6, is a view of the

three pipes radiating from the three cylinders containing fluid to be compressed.

a, is the shaft of the prime mover whose power is to be measured and the magnitude thereof indicated upon the gage *b*. A pulley *c*, is fixed upon the shaft *a*, and is coupled by a belt to either the loose pulley *d*, or the pulley *e*, which is fixed upon the same shaft *f*, which carries the loose pulley *d*. Also upon the shaft *f*, are located two wheels, the one, a pulley *h*, which is loose thereon to sufficient extent to move through an arc of a circle, and the other consisting substantially of spokes or radial projections *i, j, k*, which are fixed upon the said shaft. The hub *l*, of the wheel *h*, is prevented from too great longitudinal displacement by the collar *m*, which is held upon the shaft by the set screw *n*. The hub *o*, of the spokes *i, j, k*, is fastened upon the same shaft by means of the set screw *n'*. Each spoke of the wheel *h* has a bearing surface *p*, against which is adapted to press more or less, the piston rods *q*, the surfaces being substantially parallel to the plane of the piston *r*, which operates in the cylinder *s*, in each case. It will be noticed that the piston and the piston rod are not in any way pivoted or attached to the spokes *t, u, v*, of the wheel *h*, but that they simply rest against the said spokes. Both the three cylinders *s*, and pistons *r*, and piston rods *q*, are supported entirely by the spokes, respectively, *i, j, k*, by means of bolts, the holes for which are lettered *w*. The cylinders are permanently closed at one end as to each cylinder, while the other has in each case a stuffing box, for the passage and support of the piston rod *q*. Inasmuch as the spokes *t, u, v*, on the one hand are movable with reference to the spokes *i, j, k*, on the other hand, it is evident that when the prime mover *c*, is set in motion and a load is put upon the machine whose shaft is *C*, there will exist a force between the two sets of spokes so that the pistons *r*, will be forced into the respective cylinders *s*, and cause a compression of the fluid. This body of fluid communicates with the gage *b*, by means of suitable pipes *y*, and *y'* the latter of which are stationary with respect to the spokes *i, j, k*, and the former to the gage *b*, which may be attached to the wall of the room or

any other convenient object. In order that the stationary and rotary pipes may be connected in a manner for the communication of the fluid pressure, a trunnion z , is employed
 5 for causing the connection. In this trunnion is a nozzle z' , to act as a valve so that the pressure in the cylinders may be indicated by a gage of low capacity. The purpose of the loose pulley d , is that it may receive the
 10 belt which passes over the wheel or pulley c . When it is desired to operate the dynamometer, the pulley c , with its shaft a , may be moved to the right, for the purpose of illustrating the operation. In practice, the pulley
 15 c , would of course be wider so that the belt could be slipped to the right over the fixed pulley e , when the dynamometer and machine whose shaft is C , are to be driven.

The operation of the device is carried on
 20 by simply applying the dynamometer in the manner shown in Fig. 1, or in any equivalent manner, setting the steam engine or similar prime mover in operation, and taking the reading of the gage which may previously have
 25 been standardized, so that the reading will indicate the magnitude of the work being transmitted at any instant.

The amount of relative movement of the two sets of spokes should be at least sufficient
 30 to allow, with no work the pistons r , to reach and touch the closed ends of the cylinders s .

By my invention, I may omit the belt A , and use the shaft C , as a substitute for the shaft f . In other words, my device may be
 35 applied directly to the shaft of any given machine. It takes the place of the usual driv-

ing pulley. This is illustrated in Fig. 4, where F , is the bearing of the machine. In this case the pulley h , is driven as before by the prime mover, and communicates its motion to the
 40 machine whose shaft is f , in Fig. 4, through the medium of the fluid in the cylinders s . The pulley h , as stated, is loose upon the machine shaft f' , whose bearing is F , while the hub o , is fixed upon the said shaft, so that the
 45 power must be transmitted through the fluid as a medium.

In all ordinary cases, I use liquids in the cylinders, but in very small dynamometers, as for instance hand scales, I may make use
 50 of air or other gas.

I claim as my invention—

The combination of a rotary shaft, a collar m , thereon, and also a hub o , both of which
 55 are fixed to said shaft, a pulley h , whose hub l , is loose upon said shaft, cylinders s , pistons r , and piston rods q , all carried upon said hub o , spokes, belonging to said pulley h , and pressing upon said piston rods, a gage b , pipe
 60 y , fixed to said gage, pipes y' carried by and communicating with said cylinders, and a trunnion z , connecting the said pipe y , with the pipes y' .

In testimony that I claim the foregoing as my invention I have signed my name, in pres-
 65 ence of two witnesses, this 18th day of February, 1892.

JOHN A. CROSS.

Witnesses:

EDWARD P. THOMPSON,
 GEORGE T. MIATT.