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CONNECTING MEANS FOR INTERNAL COMBUSTION MOTORS.

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1,155,071. Patented Sept. 28, 1915.

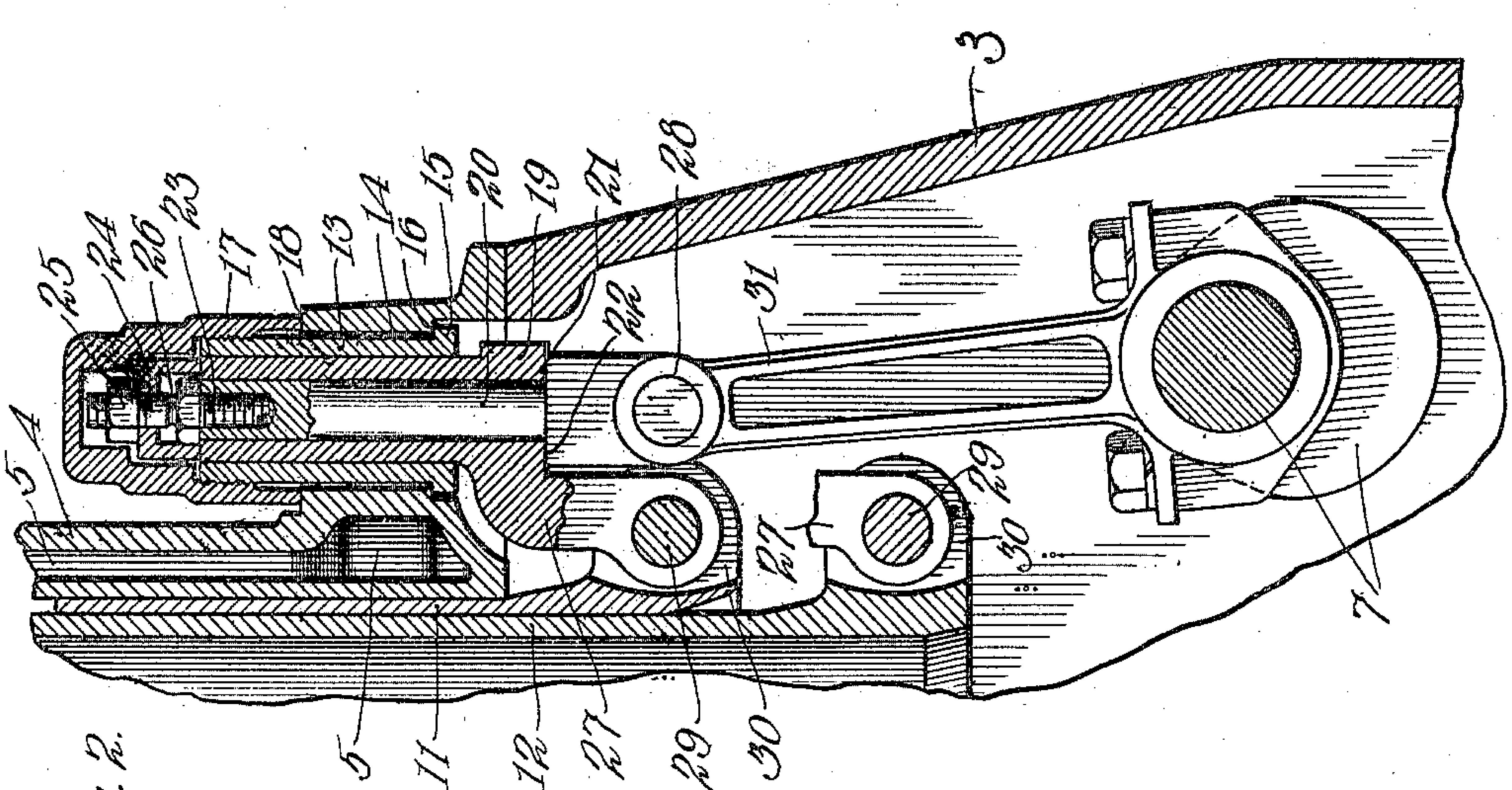

Fig. 2.

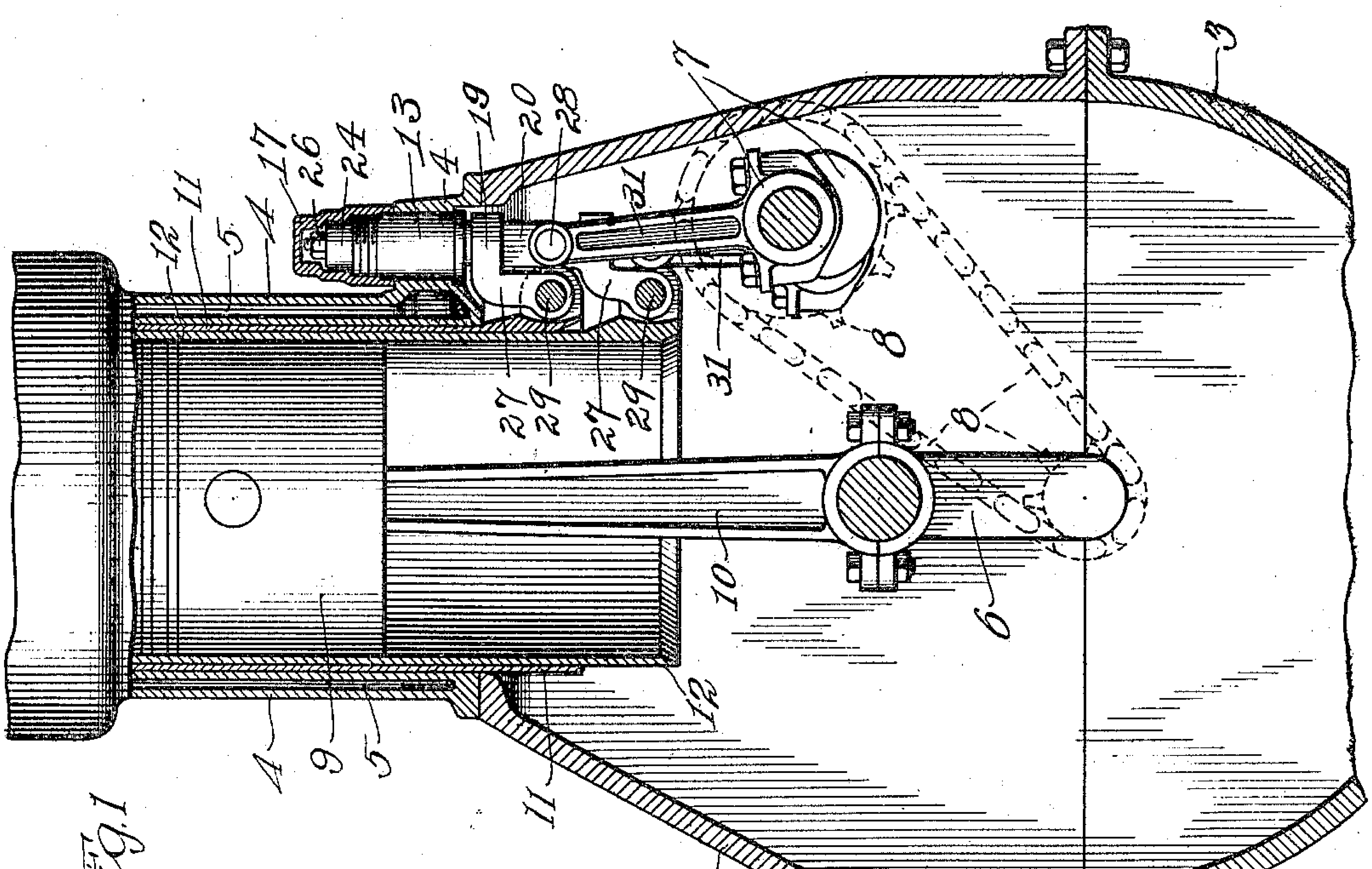

Fig. 1

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UNITED STATES PATENT OFFICE.

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CONNECTING MEANS FOR INTERNAL-COMBUSTION MOTORS.

1,155,071. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed January 25, 1915. Serial No. 4,082.

To all whom it may concern:

Be it known that I, CHARLES Y. KNIGHT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Connecting Means for Internal-Combustion Motors, of which the following is a specification.

My invention relates to improvements in driving connections for port controlling means of internal combustion engines, of the sleeve valve type, and it has for its object the provision of simple and strong mechanism of the character mentioned adapted to permit great freedom in design.

A further object is the provision of a weakened joint in said mechanism which is the weakest point in the driving connection between the port controlling means and the cam shaft of the engine. Also, to form and position said weakened joint so that it may be easily and quickly repaired if broken.

The invention consists in substantially the combination and arrangement of parts hereinafter described, shown in the accompanying drawings and more particularly specified in the subjoined claims.

In the drawings—Figure 1 is a fragmental section of an internal combustion engine embodying my improvement; and Fig. 2 is an enlarged fragmental section of the same, showing one of my improved driving connections in detail.

In designing sleeve valve internal combustion engines having comparatively small bores and long strokes, considerable difficulty has been experienced in positioning the eccentric shaft at a sufficient distance from the center of the cylinder without materially increasing the length of the lugs which are cast upon the sleeves for the purpose of connecting with the rods leading to the eccentric. It is desirable to apply force for operating the sleeves in the line of the path of travel of the sleeves, as nearly as possible. These sleeves are ordinarily formed of cast iron, owing to the superior lubricating and other qualities of the cast iron. However, because of the thinness of the sleeves and the comparative weakness of the material of which they are formed, it is desirable to form the lugs through which connections are made to the operating means, as short as possible, and apply force as nearly as possible in the line of travel of the sleeves, to produce minimum strains on such lugs and the portions of the sleeves adjacent the lugs. To this end, I have provided the novel means hereinafter described and claimed.

In the drawing, I have shown my invention as applied to an internal combustion engine of the well-known Knight sleeve type. The engine shown comprises a crank case 3, cylinder 4 mounted on and provided with the usual water-cooling space 5, a crank shaft 6 mounted in the crank case, a cam shaft 7 also mounted in the crank case and connected to the crank shaft by means of gearing 8, a piston 9 in the cylinder and connected to the crank shaft by a connecting rod 10, and between the cylinder and piston are provided telescoped port controlling sleeves 11 and 12. These parts may be of any preferred or conventional design when so desired, without departing from my invention.

My invention comprises a connecting means and mounting therefor between the cam shaft 7 and the sleeves 11 and 12.

The preferred form of my invention comprises a guide 13 disposed substantially parallel with the path of travel of the sleeves 11 and 12 and mounted in perforation 14 formed in the lower portion of cylinder 4. The guide 13 is preferably slightly smaller in diameter than the perforation 14, so that slight adjustment may be made in assembling the parts of my invention in the engine to cover machine shop inaccuracies. The guide 13 is provided with a shoulder 15 at its lower end engaging a shoulder 16 in the cylinder 4. The top of guide 13 is externally threaded and a cover 17 threaded on the threaded portion of the guide. It will therefore be seen that upon adjusting the cover 17 on the guide 13, the lower edge of the cover 17 will engage the surface 18 on the cylinder and coöperate with the shoulders 15 and 16 to lock the guide 13 in position. Variations may be made in the parts and shapes of the guide and its mounting when so desired, without departing from my invention.

Slidably mounted in the guide 13 is a member made up of portions 19 and 20. These portions 19 and 20 are preferably telescoped one within the other, as indicated, and provided with a shoulder 21 on one abutting against shoulder 22 on the other. At the upper end of the part 20 of said member, is a threaded recess in which is

threaded a stud 23 and on the stud 23 is a cap 24 resting on the upper end of part 19 of said member. On the upper end of stud 23 is a nut 25 which is screwed down against cap 24 clamping the shoulders 21 and 22 together and locking the parts 19 and 20 rigidly together. The stud 23 is provided with a weakened portion 26, preferably formed by forming a groove or notch in the stud. The weakened point 26 is so formed that the weakest point in the driving connection between the cam shaft 7 and the sleeve 11 will be at this point. The cover 17 also covers the connecting means between the upper ends of the parts 19 and 20. When so desired, the parts 19 and 20 may be made integral and the weakened connection, comprising parts 23 to 26 inclusive, be eliminated, as will be apparent from the appended claims.

The part 19 is formed with a lateral arm 27 at its lower end which has its free end connected to the ear or lug 30 of sleeve 11, by a pin 29. The lug 30 is formed very short in order to bring the pin 29 as close to the sleeve as possible, thereby reducing lateral stresses on the lug and the portions of the sleeve adjacent the lug. From this arrangement, it will be seen that the side strains or stresses incident to driving the sleeve are taken by the guide 13 and part 19. The part 19 and its arm 27 may be made of steel, steel alloys, or any other suitable material capable of standing the stresses placed upon them without danger of injury. A connecting link 31, of usual design, connects the cam shaft 7 with a pin 28 carried by part 20 to complete the connection between the cam shaft and sleeve 11. The driving connection between sleeve 12 and the cam shaft 7 is substantially the same as that already described for connecting sleeve 11 with said cam shaft. Therefore, a description of one will answer for both.

It will be seen from the above, that the cam shaft 7 may be positioned as far from a vertical line through the crank shaft 6 as is desired, without increasing the stresses on the lugs 30 or parts of the sleeves adjacent such lugs. This arrangement provides means whereby great freedom of design may be had in designing engines having relatively small bores and long strokes, without increasing the stresses on the sleeves and providing means whereby the force employed in driving the sleeves may be transmitted to the latter in substantially the paths of travel of the sleeves.

As already stated, the weakened connection between parts 19 and 20, may be eliminated and the parts formed integral, but I prefer the weakened connection for the reason that without it the lug 30 or a portion of the sleeve near such lug, would likely be broken should the sleeve stick or become inoperative, due to faulty lubrication thereof or other cause. In case of the sticking of a sleeve, the stud 23 would be broken at point 26 thereby preventing damage to other parts of the driving connection or the sleeve. The arrangement of the parts 23 to 26 inclusive is such that in case of the breaking of the stud 23, at point 26, the upper portion of stud 23, nut 25 and cap 24 will become loosened under cover 17 and the part 20 be free to reciprocate in part 19. In order to replace a broken stud 23, cover 17 is removed by a suitable wrench (not shown). The lower portion of the stud 23 is then removed by means of a suitable wrench (not shown) applied to the squared head immediately below the point 26. The new stud is then adjusted in position in part 20 and cap 24 and nut 25 placed in position on the new stud. The cover 17 is then readjusted in position. This simple arrangement provides means whereby the connection between parts 19 and 20 may be easily made without the disconnecting or removal of any other parts of the engine.

While I have illustrated and described the preferred form of my invention, I do not desire to be limited to the precise details set forth, but desire to avail myself of such variations and changes as come within the scope of the appended claims.

I claim—

1. In an internal combustion engine, the combination of a port controlling element; an eccentric shaft; a vertical guide parallel with the path of travel of the port controlling element and substantially directly over the eccentric shaft; a member slidably mounted in the guide and operatively connected with the eccentric shaft; and a laterally extending arm on said member operatively connected with the port controlling element.

2. In an internal combustion engine, the combination of a port controlling element; a guide parallel with and at one side of the path of travel of the port controlling element; an eccentric shaft substantially opposite one end of said guide; a member slidably mounted in said guide and having one of its ends operatively connected with said eccentric shaft and said port controlling element.

3. In an internal combustion engine, the combination of a port controlling element, an eccentric shaft; a guide adjacent the port controlling element; and a member made up of two parts secured together and slidably mounted in said guide, one of said parts being operatively connected with the eccentric shaft and the other of said parts being connected with the port controlling element.

4. In an internal combustion engine, the combination of a port controlling element;

an eccentric shaft; a guide adjacent the port controlling element; a member made up of two parts and slidably mounted in said guide, one of said parts being operatively connected with the eccentric shaft and the other of said parts being connected with the port controlling element; and a detachable connection between the two parts of said member.

5. In an internal combustion engine, the combination of a port controlling element; an eccentric shaft; a guide adjacent the port controlling element; a member made up of two parts and slidably mounted in said guide, one of said parts being operatively connected with the eccentric shaft and the other of said parts being connected with the port controlling element; and a detachable connection between the two parts of said member, there being a point in said detachable connection weaker than any other point in the members between the eccentric shaft and the port controlling element.

6. In an internal combustion engine, the combination of a port controlling element; an eccentric shaft; a guide parallel with the path of travel of the port controlling element; and a member comprising a tubular part slidably mounted in said guide and having an arm thereon connected with the port controlling element, and a part telescoped in said tubular part secured thereto and operatively connected with the eccentric shaft.

7. In an internal combustion engine, the combination of a port controlling element; an eccentric shaft; a guide parallel with the path of travel of the port controlling element; a member comprising a tubular part slidably mounted in said guide and having an arm thereon connected with the port controlling element and a part telescoped in said tubular part; and a detachable connection between the tubular part and the other part of said member.

8. In an internal combustion engine, the combination of a port controlling element; an eccentric shaft; a guide parallel with the path of travel of the port controlling element; a member comprising a tubular part slidably mounted in said guide and having an arm thereon connected with the port controlling element, and a part in said tubular part; and a detachable connection between the tubular part and the other part of said member, there being a point in said detachable connection weaker than any other point in the members between the eccentric shaft and the port controlling element.

9. In an internal combustion engine, the combination of a casing having an opening therein; a port controlling sleeve; a guide mounted in said opening and adapted for lateral adjustment therein; an eccentric shaft adjacent said guide; a member slidably mounted in said guide; and connections operatively connecting said member with said sleeve and said eccentric shaft.

10. In an internal combustion engine, the combination of a casing having an opening therein; a port controlling sleeve; a guide in said opening and having a shoulder thereon engaging the casing; an eccentric shaft adjacent said guide; a member comprising two parts slidably mounted in said guide, one of said parts being connected with the eccentric shaft and other of said parts being connected with the sleeve; a weakened connection connecting the two parts of said member; and a cover covering said weakened connection and secured to said guide locking the latter in said opening.

11. In an internal combustion engine, the combination of a casing having an opening therein; a port controlling sleeve; a guide in said opening and having a shoulder thereon engaging the inner side of the casing; an eccentric shaft adjacent the guide; a member slidably mounted in said guide and operatively connected with said sleeve and said eccentric shaft; and a detachable cover covering one end of said member, threaded on said guide and coöperating with the shoulder on the latter to secure the guide in said opening.

12. In an internal combustion engine, the combination of a port controlling sleeve; a guide disposed parallel with the path of said sleeve; an eccentric shaft adjacent said guide; a member comprising two telescoping parts and slidably mounted in said guide, one of said parts being connected with the eccentric shaft and the other of said parts being connected with the sleeve; a stud threaded in the innermost of the parts of said member; a cap on said stud and engaging the outermost of the parts of said member; and a nut threaded on said stud and clamping said cap against said outermost part, there being a weakened portion in said stud between said nut and the portion thereof threaded in the innermost part of said member.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 21st day of January A. D. 1915.

CHARLES Y. KNIGHT.

Witnesses:
THOS. COLSON,
ALLENA OFFUTT.